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DICKENS'S STORY LEFT HALF TOLD.

BY RICHARD A. PROCTOR.

AN apology is due to my friend Mr. Foster, for the introduction of "H. L.'s" letter about Dickens's Half-Told Story, among the articles in KNOWLEDGE for November 28. It was open to "H. L." to reply in a letter to Mr. Foster's criticisms, and had I been at home when his letter arrived I would willingly have found space for it; but it was manifestly a mistake to treat the letter in such a way as to convey the idea that Mr. Foster's careful and elaborate investigation of Dickens's last work was intended merely as a reply to "H. L." For this mistake, which occurred in my absence, Mr. Foster has my apologies.

Of course, Mr. Foster does not propose to enter into any discussion of the subject with "H. L.," who takes so hopelessly prosaic a view of Dickens's melodramatic story that controversy with him would be idle. Mr. Foster's interpretation of the mystery was published seven or eight years ago, and his recent papers in these columns were simply intended to present the evidence afresh, with somewhat greater fulness of detail as respects certain portions of the story than had been possible in the pages of the *Belgravia Magazine*.

The only points to be noticed in "H. L.'s" recent communication (outside its rather truculent tone) are points of detail. As to the manner of Jasper's attack on Drood, Mr. Foster has but an opinion, which is as likely to be wrong as right. Dickens gives very little information on this point, and guesses about it are as difficult as guesses would be about the pattern of Edwin's waistcoat on the occasion. A passage in Jasper's dreamy talk to the opium-woman suggests that Jasper looked down on the body from a height; and the nocturnal climb up the great staircase seems to suggest that Jasper had *some* purpose up there. Unquestionably, if Drood had been killed in a fall from the tower and Jasper had not been able to remove the body to the tomb he had chosen, and to get rid of all traces of the murder, there would still have been no manner of risk to Jasper himself, for "dead men tell no tales," and an accident would have been the accepted explanation. He would simply have failed in bringing suspicion on Neville as his full scheme, successfully carried out as he supposed, enabled him to do. As for the appeal to what "H. L." calls "human credibility,"—meaning probably "credulity,"—any one who has read "No Thoroughfare" will find there precisely the same sort of appeal. A murderous villain, very much of Jasper's type, armed with a dagger, attacks a victim so drugged as to be helpless, on the edge of an ice-bound precipice. Yet despite the danger from the poison, the dagger, the fall from the precipice, and the snows, which last actually cause the poor fellow's death if it means anything to say that "his heart stood still" (not for a moment but long enough to show that he was dead if he *could* be killed), *this* victim of Dickens's ingenuity comes all right again, to confront his murderer as Drood was to have confronted his.

I studied with Mr. Foster, years since, the cathedral which was the original of Cloisterham, and there can be no doubt of the possibility of such escape as Mr. Foster has suggested. But neither he nor I regard the manner of the attack on Drood as inferrible from the story.

The writing of "crypt" for "churchyard," by which, says "H. L." politely but vaguely, Mr. Foster "has convicted himself" (of something not defined), was a manifest slip of the pen having no bearing whatever on Mr. Foster's views.

I write so much, partly because my absence from London led to the mistake for which I have had to apologise, partly because I myself published in the columns of an evening paper, a solution of the mystery of Edwin Drood which is to all intents and purposes the same as Mr. Foster's,—a little before the appearance of the article in the *Belgravia Magazine*, if I remember rightly.

I may add that during the last seven or eight years I have talked over Dickens's last story with many (I should suppose with hundreds) of readers and lovers of Dickens's stories; and I think I am not exaggerating in saying that certainly nineteen out of twenty accept the identity of Datchery and Drood, so soon as it is suggested, as obviously the true interpretation. About one-tenth say that they never had any doubt about Datchery being Drood from the very introduction of the Datchery assumption,—my own experience. I think no one who has really studied Dickens's other stories, and learned his ways, can have much doubt on the subject, even unhelped by suggestions from others. Mr. Foster's experience has been similar.

"H. L.'s" letter does not really touch on the true evidence in the matter of the Mystery of Edwin Drood. He misunderstands Mr. Foster's ideas,—as for instance in supposing that Datchery reddened "with surprise" (which he even italicises) and that Datchery—*i.e.* Drood—did not recognise the old woman at once. So when he asks "Where did Mr. Foster learn logic?" he clearly misapprehends Mr. Foster's remark that Neville, Drood, and Jasper were certainly to meet again. Mr. Foster is drawing an inference from Dickens's well-known ways in regard to the headings of chapters, &c. When Dickens heads a chapter "When will these three meet again?" those who understand Dickens know certainly that the three *will* meet again, and that when they meet the *crisis* of the story will have come. Of course, one does not expect "H. L." to see this.

The ideas formed by the more prosaic readers, including "H. L." (who must by no means imagine that his article in the *Cornhill Magazine* contained more than the inferences from what Dickens intended to lie on the face of his story *) are somewhat as follows,—

The quaintly humorous, gentlemanly, sympathetic, and

* Miss Meyrick, author of the article in the *Century* to which "H. L." refers says that the idea of Datchery being Drood will be corrected by a careless reading of the story: that is nearer the

wistful Datchery, is "some detective employed by Grewgious." (Imagine a wistful detective!)

Though Dickens said to Miss Hogarth (who unquestionably was the only person to whom he would have communicated anything near his real ideas) that he feared "the Datchery assumption" (even what he had already written about it) might explain the mystery, "H. L." insists that there is no assumption at all (for if Datchery is "some detective" what assumption is there?), and that the character, so far as dealt with, throws no light at all on the mystery,—unless "H. L." considers *his* interpretation of Datchery self-luminous.

Though Dickens flatly told Forster that he would not communicate the real idea of the mystery, "H. L." will have it that what Dickens said to Forster immediately afterwards, was the real solution.

"H. L." believes that Dickens communicated to Fildes the true end of the story, though it is well-known he never gave Hablot Brown or Marcus Stone the least inkling of the true end of any of the stories they illustrated.

The figure in the tomb from which Jasper shrinks back appalled in the suggestive picture at the foot of the number-cover is not Edwin Drood, but Neville playing bogey. "H. L." would admit, I suppose, that the figure was meant to terrify Jasper by its resemblance to Drood, yet there is Jasper with a lantern, apparently of excellent quality, staring hard at the face of the figure, and yet "H. L." thinks, conceivably mistaking Neville's face for Drood's, though the two were as unlike as they could well be.*

If "H. L.'s" ideas are correct, the "Mystery of Edwin Drood" is flat, stale, and unprofitable. But let any who have not read the story, or having read it have not suspected that Drood really escaped and returns as Datchery, go through the half-written story with this interpretation in view, and I fancy they will find the incomplete novel more interesting than many fine novels which have been written out to the end. It was to suggest this that Mr. Foster wrote his article.

truth than she imagined. A careful and appreciative reading will give better results.

* Dickens, we know from a dozen similar cases, would have had no difficulty in explaining why Jasper failed to recognise Drood on the one occasion when he had an opportunity of seeing him close at hand. A real change of appearance might well have followed six months of slow recovery from the effects of the attack, &c. This, and the disguise (the voice also being altered), would suffice to prevent Jasper from even imagining that Datchery was the man he supposed he had not only slain but gotten rid of utterly. That Datchery had passed through an ordeal is evident from what he says after his meeting with Jasper. It would have been no ordeal for "some detective."

THE ENTOMOLOGY OF A POND.

By E. A. Butler.

ABOVE THE SURFACE (*continued*).

ANOTHER of the Hydrocampidæ, called *Cataclysta lemnalis* (Fig. 1) is very common over ponds in which duckweed abounds. It is a small whitish insect, with the edge of its hind wings adorned with what looks like a row of tiny sparkling diamonds set in a band of jet. Its larva is a little black fellow with velvety skin; it feeds on duckweed (*Lemna*), and, as usual, inhabits a case covered with the leaves of its food-plant, but, unlike the Hydrocampas, the case needs to be made of more than two pieces, on account of the minute size of the leaves. It is of an irregular oval form, about half an inch in length, and rather less than half as much in breadth; the leaves of which it is composed are laid so as to overlap, and at the two ends some of them hang down over the openings, so that when the little hermit is within its cell, one can hardly distinguish the case from a mere accidental collection of duckweed leaves, such as may so frequently be met with. The late Mr. W. Buckler, who devoted his time with remarkable assiduity to studying, describing, and figuring the preparatory stages of many Lepidoptera, found that a larva of the present species, when deprived of its case, took only six minutes to put together the leafy framework of another, inside which it remained for a time invisible, apparently busy in finishing it off with a neat lining of silk. Its body is apparently impervious to moisture, for after submergence for any length of time, it comes up to the surface as dry as when it went down. Like the Hydrocampas, it hibernates during the winter months, and begins to feed again in the warmest days of April, the perfect insect appearing in May and June. It pupates in its larva case, and after the issue of the moth, the old case is found to contain both the last cast skin of the larva, and the empty and broken pupa case.

The caterpillars of the three insects already mentioned, though living beneath the surface of the water, are not provided with any means of subaqueous respiration; they are furnished with the ordinary spiracles, and breathe air directly in the usual manner, and the tiny globules of air that hang about the margins of the spiracles like so many silvery beads and streaks, look very pretty on the sooty-black body of *Cataclysta*. But the larva of *Paraponyx stratiotalis*, a brownish moth much like a Hydrocampa, besides its spiracles, is possessed of organs similar to those we have so often referred to before, through the thin walls of which the air dissolved in water can diffuse into the tracheæ with which they are furnished. These organs are usually called "tracheal gills," a not very appropriate name, inasmuch as a gill is properly an organ to which the blood is conveyed in great quantities, *there* to receive the revivifying action of the oxygenated water that passes over it; but in this case, the gas is conveyed to the blood throughout the body, instead of the blood to it.

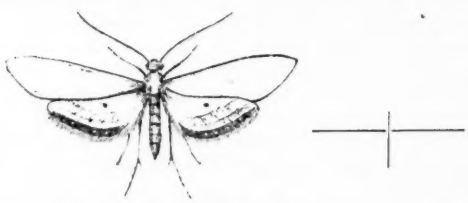

Fig. 1.—Cataclysta lemnalis.

The last and most remarkable species of the family is one that we have had occasion to mention once before—*Acentropus niveus*, noted as having been for a time a bone of contention between entomologists, the questions in debate being, first, whether it was a moth or a caddis-fly, second, admitting its lepidopterous character, whereabouts in that order it was to be located, and third, whether there was more than one species. It is a small, whitish insect, which appears in July, and is nocturnal in habits. During the daytime it sits about on weeds, sticks, boards, &c., close to the water's edge, and is very sluggish, not taking to wing unless disturbed. But just about dusk its spirits revive, and it starts on its nocturnal peregrinations, skimming about in broken circles so close to the surface of the water as to seem to be actually swimming; while flying, it scarcely ever seems to leave the surface, but, every now and

then, as if to seek a brief interval of rest in the midst of its circuitous and dodgy flight, it glides off and settles on the mud at the margins of the pond. In spite of its small size—little more than half an inch in expanse of wings—its pale appearance renders it somewhat conspicuous; still, on account of its peculiar habits, its capture is not at all easy; even when safely lodged in the net, its restlessness is so great that it speedily damages its delicate wings, hence it has been recommended to observe in the evening where the insect is common, and to go next day and box them in pill boxes off their resting-places.

The white, roundish eggs are laid on the leaves of different species of *Potamogeton*, or pond-weed, the mother diving for the purpose. The caterpillar is light green, and, like that of the preceding insect, is furnished with tracheal gills. It feeds on pond-weeds, but without a case, and, when fully fed, forms a silken cocoon, which it strengthens by incorporating in its substance fragments of the leaves of its food-plant; the cocoons are placed in the axils of the leaves of the pond-weed. There are two varieties of the female, one with rudimentary wings, or sometimes even without any trace of them at all, and the other with wings fully developed. The former appears at the end of May, and seems to be the produce of caterpillars which, like many other of the Lepidoptera, were hatched too late in the preceding season to complete their metamorphosis before winter, and have therefore existed in a torpid condition through the winter months, completing their life-cycle the following spring. The other is the produce of a later brood. The pairing of these insects takes place either on, or actually beneath, the surface of the water, and not only the female, but her consort as well, thinks nothing of taking a little jaunt below the surface, coming up again with wings as dry as though they had never been near the water. This is certainly most extraordinary conduct on the part of a moth.

There yet remains one other order that contributes to the fauna above the surface—viz., the Diptera. Of these the most important are the gnats and midges, whose preliminary stages we traced out some time ago. They constitute the dancing crowds that enliven the air with their incessant gambols a few feet above the surface of the pond. These crowds sometimes assume gigantic proportions, sufficient to excite popular attention, and even sometimes to create quite a sensation. Thus it is recorded that in the year 1736 vast clouds were seen to rise in the air above Salisbury Cathedral, which, at a distance, so resembled columns of smoke as to give rise to a report that the cathedral was on fire. A similar alarm occurred at a place in Silesia in 1812. Again, in 1766, enormous numbers were seen at Oxford, resembling a black cloud, and even darkening the air for a time. But these are very exceptional cases, and usually the swarms are of very moderate dimensions. They consist almost entirely of male insects, and Westwood says he has observed that, when executing their merry dances, they always fly with their heads towards the quarter from which the wind blows.

(*To be continued.*)

HONOURS AT THE HEALTH EXHIBITION.—The Jury Commission has awarded Mr. W. J. Harrison, F.G.S., Science Demonstrator for the Birmingham School Board, a special certificate of thanks for the system of science-teaching carried out under his direction in the Board Schools of Birmingham.

LENGTH OF SUBMARINE CABLES.—*Kosmos* puts the total length of all the submarine cables at present laid at 68,352 miles, or nearly three times the circumference of the globe. Each cable consists of forty wires, so that the total length of iron and copper wire used amounts to twenty-five millions of miles, or ten times the distance between the earth and the moon.

PARENTS AND CHILDREN.

A NOTE ON THE LAW OF HEREDITY IN ITS RELATION TO THE TRAINING OF CHILDREN.

BY RICHARD A. PROCTOR.

THE principle of heredity has now been generally accepted, but many of the conclusions which follow from it seem to have been little thought of by many of those who most fully accept the principle itself. Amongst the most important of these may be mentioned the changed view of parental duties and parental responsibilities which presents itself when we consider how the character of each child born into the world depends almost wholly on influences derived from the child's parents. In old times, men's ideas respecting the training of children, the duties of children to their parents, and the duties of parents to their children, were comparatively simple. The child's mind was regarded as a blank page on which anything could be written that the child's teachers might desire. The child's good qualities were regarded as involving merit which deserved reward; the child's bad qualities were regarded as involving offence which deserved punishment. The duty of the child to its parents was held to be very distinct and definite, while beyond the duty of maintaining the child, the parents' responsibility, according to old-fashioned ideas, was limited to the inculcation of moral and social duties (by precept rather than by example), and the employment of a system of rewards and punishments for the development of the child's good qualities and the correction of its bad ones.

All this is practically very little changed, though the absurdity and unfairness of the old system have been demonstrated over and over again in recent years. Children are not only unlike, instead of being like, as the old system implied, but unlikeness is their most striking characteristic. Instead of its being probable that a well-chosen system of training will suit ninety-nine children out of a hundred, the chances are that no system of training could be devised which would really be suitable for any two children out of a hundred. The children of the same family differ strangely from each other. Though all their qualities are derived from the same source, the proportions in which these qualities have been received are so different that, as a rule, no two children, even in a large family, are closely alike in character. If this is so in one and the same family, as every one who has observed such families must have noticed, how absurd must be the attempt to select any system of training which shall suit scores of boys or girls (or, as in America, of boys *and* girls) belonging to different families. With a recognition of the laws of heredity, the old-fashioned system of training ought in this respect to have been entirely altered.

But not only has the position of the trainer and teacher of children been altered with the new lights under which character now presents itself, but the relations of the child to the parents and of the parents to the child have been entirely altered. In all the various stages of a child's life from babyhood to manhood or womanhood, the character, however much it may change naturally or be affected by external influences, is in the main a product of development. It is as hopeless to apply a system of rewards and punishments to modify the essentials of character, at any stage of child-life, as it would be to attempt to alter by an elaborate system of watering or manuring the fruit of the pear-tree into the fruit of the walnut-tree, or *vice versâ*. Moreover, the character of the child at the different stages of child-life is very differently related to the parental character. In early childhood the character is not only

remoter from the parental type, but partakes even of many of the characteristics of animal types. The very young child is in reality wanting in most of the essential attributes of human types of character, in most of the features which distinguish man from the lower animals. A baby is an engaging animal, but still it is little more than an animal. It cannot be said to reason, more at any rate than a clever dog or monkey seems to reason. It has no distinct ideas of right or wrong. It has appetites and wants, and nearly all that it does is ruled by those appetites and wants—at first almost wholly, later with such limitations as are suggested by the effects of experience, more or less consciously acted upon. The system of training appropriate at this stage of child-life—in fact, the only system available—is akin to the system of training used for animals. The tender nurse and the loving mother may object to this statement, but she acts on this principle. Moreover, a parent can more fairly act in this way to the very young child than to one that begins to show peculiarities of character more nearly approaching to those of either parent, or of others of the child's near kindred. Parents can hardly feel responsible for those faults of character in the baby which, according to the principles of heredity, have not been directly handed down to the infant by them, but belong to much more remote progenitors. Similar remarks apply to the following stage of early childhood, the stage when the child resembles in character the savage rather than the mere animal. It is at these two stages, chiefly, that the old-fashioned system of training can alone be adopted, though even at those early stages discrimination is required, because of the different degrees in which animal or savage peculiarities of character are recognised. Some babies are good little animals, though they have animal-faults which require correction; others, on the contrary, are bad little animals, and require for their own good (and even for their own safety) a severer system of treatment. So with young children a stage or so later. Some are very pleasant little savages, though they have some savage tricks which must not be encouraged, but checked; others are terrible little barbarians, and unless ruled with a rather strong hand will do mischief to others, and (probably) still more serious mischief to themselves. For these earlier stages of child-life, a system of training and, where necessary, of control and even severity, has to be adopted; and the only considerations to be attended to in selecting the most appropriate measures are those depending on the individual traits of character observed at this stage of the growing child's life. At this time it may sometimes happen that the old-fashioned system of severity—the old-fashioned doctrine that he who spareth the rod hateth his child—may be unfortunately appropriate. Even in the animal and savage stages of a child's life, however, gentleness and kindness are nearly always better than sternness and severity. Nearly always it is the weakness of the parent rather than the fault of the child which calls for correction, though correction falls on the child, not on the parent. The child sees examples of ill-temper and obstinacy, falls into obstinate and ill-tempered ways, and is presently punished, more because its faults excite anger than because, when wisely considered, they are held to require such correction as may lead to their being gradually eliminated from the character. It would be difficult to say what proportion of the faults of manhood have their origin at this stage of life, because the faults then springing into existence are afterwards commingled with those inherited from the parents or through the parents. But there can be little doubt that for want of patient and judicious training, and occasional correction, erring rather on the side of pity than of severity, many characters are seriously impaired before the inherited traits have begun to show themselves with any degree of distinctness.

It is, however, later in life, in boyhood and girlhood, young manhood and young womanhood, that we recognise the more difficult part of parental training. Many parents, indeed, nay most, overlook the special considerations to which they ought to attend, now that the development of the law of heredity has made the origin of individual peculiarities of character clear; but this does not affect the argument. In every family we see, at one or another part of the child's life, the faults and good qualities of the parents or of other near relations showing themselves with greater or less distinctness. Faults may be so punished that the child conceals them: yet they are there. It very seldom happens that they are not at some time or other shown, in such sort that the parents can see what manner of man or woman the child will grow up to be. Now here a very difficult question of responsibility and duty presents itself. A father, we will say, recognises in his child a fault which he knows to be inherited both from and through himself—in other words, what is called a family failing. The consciousness that he himself has the fault does not in any degree diminish the annoyance caused by it; rather the reverse, seeing that faults in others are all the more provoking if we are ourselves liable to them. But the right to punish and the duty of punishment are curiously affected by consideration of the hereditary nature of the fault. I am, let us say, prone to violent fits of temper, or to moroseness, or to obstinacy; some fine day, a son or daughter of mine exhibits, in a marked degree, the same failing, which I know to be mine, which I know I have inherited, and which I equally know I have transmitted. I know that in his or her career my child will suffer from the effects of this family failing, unless every pains be taken either to eradicate it or to bring it under mastery, making of it a servant instead of a tyrant. Of old, my course would have been clear enough, though painful. I should have felt it my obvious duty to use correction of such degree of severity—and no more—as was necessary to compel my child to master his fault or temper. (Of course, I am considering here the case of a parent who recognises his duty in such matters; one who does not would probably thrash his son or punish his daughter in such severe ways as might occur to him, with no other object but to get rid of the annoyance caused by the child's fault.) But when the parent recognises the fault of disposition or of temper as in reality his own, though manifested by the child, the position becomes difficult and painful. A parent may be obliged by a sense of duty to punish his own fault in his child, being all the while conscious that for the existence of the fault in the child he is himself responsible. It is easily seen, too, that in the case of far-seeing persons (those farthest removed from the savage state), the sense of duty, or rather the feeling of doubt and difficulty in this matter, would extend further. The father who, knowing that some fault of temper has been a source of sorrow or misery to himself, feels that, let it have come how it may (not that he has any doubt whence it came), this fault in his child must be corrected, might very well consider that, since children could only be born to him at the risk of inheriting this source of sorrow and misery, it would not be well that children should be born to him at all. The old argument against Malthusian doctrines, that a child born into the world may possibly become one in the choir of heaven, singing God's praises everlastingly, so that all doctrines by which the number of such children may be diminished (as by late marriage,

&c.) are sinful, might be met, even in the general case, by the answer that a child born into the world may possibly have a quite different future; but in particular cases the probabilities are so enormously against the happier, and in favour of the less happy, fate, that the argument (*if it is worth anything at all*) might be applied very effectively, at any rate, against early marriage. Be this, however, as it may, it is evident that due consideration of the doctrine of heredity should lead a parent, who recognises his own faults in his offspring, to be very careful and tender, however earnest, in his endeavour to eradicate such faults. When I hear of, or see parents harshly punishing their children for faults which they must *know* that they themselves possess and have transmitted to their offspring, I am inclined sometimes to wonder whether they will be able to look their children in the face in after years, when the real origin of such faults has become as clear to the younger as to the older possessors of them. If the younger were not, happily, much more forgiving as a rule than their elders, how much might the peace of families be disturbed in after years by the recollection of past severities inflicted by parents on children for faults which would have had no existence but for the parents, and which the parents show in at least as marked a degree as their offspring. And, again, how singularly would the lives of young people be affected if parents considered carefully the precept, "Let him that is without fault," &c.—*Newcastle Weekly Chronicle.*

THE CHEMISTRY OF COOKERY.

By W. MATTIEU WILLIAMS.

I.—THE VEGETARIAN QUESTION.

IN my introductory paper I said, "The fact that we use the digestive and nutrient apparatus of sheep, oxen, &c., for the preparation of our food is merely a transitory barbarism, to be ultimately superseded when my present subject is sufficiently understood and applied to enable us to prepare the constituents of the vegetable kingdom to be as easily assimilated as the prepared grass which we call beef and mutton."

This has brought me in communication with a very earnest body of men and women, who at considerable social inconvenience are abstaining from flesh-food, and doing it purely on principle. Some people sneer at them, call them "crotchetty," "faddy," &c., but, for my own part, I have a great respect for crotchetty people, having learned long ago that every first great step that has ever been taken in the path of human progress was denounced as a crotchet by those it was leaving behind. This respect is quite apart from the consideration of whether I agree or disagree with the crotchets themselves.

I therefore willingly respond to the request that I should devote one short paper of this series to the subject. The fact that there are now in London nine exclusively vegetarian restaurants, and all of them flourishing, shows that it is one of wide interest.

At the outset it is necessary to brush aside certain false issues that are commonly raised in discussing this subject. The question is not whether we are herbivorous or carnivorous animals. It is perfectly certain that we are neither. The carnivora feed on flesh *alone*, and eat that flesh raw. Nobody proposes that we should do this. The herbivora eat raw grass. Nobody suggests that we should follow *their* example.

It is perfectly clear that man cannot be classed either with the carnivorous animals nor the herbivorous animals, nor with the graminivorous animals. His teeth are not constructed for munching and grinding raw grain, nor his digestive organs for assimilating such grain in this condition.

He is not even to be classed with the omnivorous animals. He stands apart from all as THE COOKING ANIMAL.

It is true that there was a time when our ancestors ate raw flesh, including that of each other.

In the limestone caverns of this and other European countries we find human bones gnawed by human teeth, and split open by flint implements for the evident purpose of extracting the marrow, according to the domestic economy of the period.

The shell mounds that these prehistoric bipeds have left behind, show that mussels, oysters, and other mollusca were also eaten raw, and they doubtless varied the menu with snails, slugs, and worms, as the remaining Australian savages still do. Besides these they probably included roots, succulent plants, nuts, and such fruit as then existed.

There are many among us who are very proud of their ancient lineage, and who think it honourable to go back as far as possible, and to maintain the customs of their forefathers; but they all seem to draw a line somewhere, none desiring to go as far back as to their interglacial troglodític ancestors, and, therefore, I need not discuss the desirability of restoring their dietary.

All human beings became cooks as soon as they learned how to make a fire, and have all continued to be cooks ever since.

We should, therefore, look at this vegetarian question from the point of view of prepared food, which excludes nearly all comparison with the food of the brute creation. I say "nearly all," because there is one case in which all the animals that approach the nearest to ourselves—the mammalia—are provided naturally with a specially prepared food, viz., the mother's milk. The composition of this preparation appears to me to throw more light than anything else upon this vegetarian controversy, and yet it seems to have been entirely overlooked.

The milk prepared for the young of the different animals in the laboratory or kitchen of Nature is surely adapted to their structure as regards natural food requirements. Without assuming that the human dietetic requirements are identical with either of the other mammals, we may learn something concerning our approximation to one class or another by comparing the composition of human milk with that of the animals in question.

I find ready to hand in Dr. Miller's "Chemistry," Vol. III., a comparative statement of the mean of several analyses of the milk of woman, cow, goat, ass, sheep, and bitch. The latter is a moderately carnivorous animal, nearly approaching the omnivorous character commonly ascribed to man. The following is the statement:—

	Woman	Cow.	Goat.	Ass.	Sheep.	Bitch.
Water	88·6	87·4	82·0	90·5	85·6	66·3
Fat	2·6	4·0	4·5	1·4	4·5	14·8
Sugar and Soluble Salts	4·9	5·0	4·5	6·4	4·2	2·9
Nitrogenous compounds and Insoluble Salts ..	3·9	3·6	9·0	1·7	5·7	16·0

According to this it is quite evident that nature regards our food requirements as approaching much nearer to the herbivora than to the carnivora, and has provided for us accordingly.

If we are to begin the building-up of our bodies on a food more nearly resembling the herbivora than the carni-

vora, it is only reasonable to assume that we should continue on the same principle.

The particulars of the difference are instructive. The food which nature provides for the human infant differs from that provided for the young carnivorous animal, just in the same way as flesh food differs from the cultivated and cooked vegetables and fruit within easy reach of man.

These contain less fat, less nitrogenous matter, more water, and more sugar (or starch, which becomes sugar during digestion) than animal food.

Those who advocate the use of flesh food usually do so on the ground that it is more nutritious, contains more nitrogenous material and more fat than vegetable food. So much the worse for the human being, says Nature, when *she* prepares the food.

But as a matter of practical fact there are no flesh-eaters among us, none who avail themselves of this higher proportion of albuminoids and fat. We all practically admit every day in eating our ordinary English dinner, that this excess of nitrogenous matter and fat is bad; we do so by mixing the meat with that particular vegetable which contains an excess of the carbo-hydrates (starch) with the smallest available quantity of albuminoids and fat. The slice of meat, diluted with the lump of potato, brings the whole down to about the average composition of a fairly-arranged vegetarian repast. When I speak of a vegetarian repast, I do not mean mere cabbages and potatoes, but properly selected, well cooked, nutritious vegetable food. As an example, I will take Count Rumford's No. 1 soup, already described, without the bread, and in like manner take beef and potatoes without bread. Taking original weights, and assuming that the lump of potato weighed the same as the slice of meat, we get the following composition according to the table given by Pavy, page 410 :—

	Water.	Albumen	Starch.	Sugar.	Fat.	Salts.
Lean Beef	72·00	19·30			3·60	5·10
Potatoes	75·00	2·10	18·80	3·20	0·20	0·70
	147·00	21·40	18 80	3·20	3·80	5·80
Mean Composition of Mixture.....	73·50	10·70	9·40	1·60	1·90	2·90

Rumford's soup (without the bread afterwards added) was composed of equal measures of peas and pearl barley, or barley meal, and nearly equal weights. Their percentage composition as stated in above-named table is as follows :—

	Water.	Albumen.	Starch.	Sugar.	Fat.	Salts.
Peas.....	15·00	23·00	55·40	2·00	2·10	2·50
Barley Meal	15·00	6·30	69·40	4·90	2·40	2·00
	30·00	29·30	134·80	6·90	4·50	4·50
Mean Composition of Mixture	15·00	14·65	62·40	3·45	2·25	2·25

Here, then, in 100 parts of the material of Rumford's halfpenny dinner, as compared with the "mixed diet," we have 40 per cent. more of nitrogenous food, more than six and a half times as much carbo-hydrate in the form of starch, more than double the quantity of sugar, about 17 per cent. more of fat, and only a little less of salts (supplied by the salt which Rumford added). Thus the John Bull materials fall short of all the costly constituents, and only excel by their abundance of very cheap water.

This analysis supplies the explanation of what has puzz'ed many inquirers, and encouraged some sneerers at this work of the great scientific philanthropist, viz., that he found that less than five ounces of solids was sufficient for each man's dinner. He was supplying far more nutritious material than beef and potatoes, and, therefore, his five ounces was more satisfactory than a pound of beef and potatoes, three-fourths of which is water, for which water John Bull pays a shilling or more per pound when he buys his prime steak.

Rumford added the water at pump cost, and, by long boiling, caused some of it to unite with the solid materials (by the hydration I have described), and then served the combination in the form of porridge, raising each portion to 19¾ ounces.

I might multiply such examples to prove the fallacy of the prevailing notions concerning the nutritive value of the "mixed diet," a fallacy which is merely an inherited epidemic, a baseless physical superstition.

I will, however, just add one more example for comparison—viz., the Highlander's porridge. The following is the composition of oatmeal—also from Pavy's table :—

Water	15·00	Sugar	5·40
Albumen	12·60	Fat	5·60
Starch	58·40	Salts	3·00

Compare this with the beef and potatoes above, and it will be seen that it is *superior in every item excepting the water*. This deficiency is readily supplied in the cookery.

These figures explain a puzzle that may have suggested itself to some of my thoughtful readers—viz., the smallness of the quantity of dry oatmeal that is used in making a large portion of porridge. If we could, in like manner, see our portion of beef or mutton and potatoes reduced to dryness, the smallness of the quantity of actually solid food required for a meal would be similarly manifest. An alderman's banquet in this condition would barely fill a breakfast-cup.

I cannot at all agree with those of my vegetarian friends who denounce flesh-meat as a prolific source of disease, as inflaming the passions, and generally demoralising. Neither am I at all disposed to make a religion of either eating, or drinking, or abstaining. There are certain albuminoids, certain carbo hydrates, certain hydro-carbons, and certain salts demanded for our sustenance. Excepting in fruit, these are not supplied by nature in a fit condition for *our* use. They must be prepared. Whether we do *all* the preparation in the kitchen by bringing the produce of the earth directly there, or whether, on account of our ignorance and incapacity as cooks, we pass our food through the stomach, intestines, blood-vessels, &c., of sheep and oxen, as a substitute for the first stages of scientific cookery, the result is about the same as regards the dietetic result. Flesh feeding is a nasty practice, but I see no grounds for denouncing it as physiologically injurious.

In my youthful days I was on friendly terms with a sheep that belonged to a butcher in Jermyn-street. This animal, for some reason, had been spared in its lambhood, and was reared as the butcher's pet. It was well known in St. James's by following the butcher's men through the streets like a dog. I have seen this sheep steal mutton-chops and devour them raw. It preferred beef or mutton to grass. It enjoyed robust health, and was by no means ferocious.

It was merely a disgusting animal, with excessively perverted appetite; a perversion that supplies very suggestive material for human meditation.

My own experiments on myself, and the multitude of other experiments that I am daily witnessing among men of all occupations who have cast aside flesh food after many years of mixed diet, prove incontestably that flesh

food is quite unnecessary; and also that men and women who emulate the aforesaid sheep to the mild extent of consuming daily about two ounces of animal tissue combined with six ounces of water, and dilute this with such weak vegetable food as the potato, are not measurably altered thereby so far as physical health is concerned.

On economical grounds, however, the difference is enormous. If all Englishmen were vegetarians the whole aspect of the country would be changed. It would be a land of gardens and orchards, instead of gradually reverting to prairie grazing-ground as at present. The unemployed miserables of our great towns, the inhabitants of our union workhouses, and all our rogues and vagabonds, would find ample and suitable employment in agriculture. Every acre of land would require three or four times as much labour as at present, and feed five or six times as many people.

No sentimental exaggeration is demanded for the recommendation of such a reform as this.

I must apologise for this digression, as it has prevented me from closing this series with this paper, as I intended. In my next, which really will conclude, I shall describe some experiments I have recently made on the preparation of vegetable food.

NEEDED STAR SURVEYS.

By RICHARD A. PROCTOR.

IN my article on Sir W. Herschel's two methods of gauging the star-depths, I showed that, in a sense, both methods failed, one obviously to himself, the other as tested by his own method of reasoning. But let us consider what we mean when we say that either method failed, and then note what each method showed, what other methods are suggested by the results of applying those, and lastly what further plans are available for the survey of the star-depths.

Herschel's first method of gauging the heavens was based on the assumption that the greater the number of stars seen with a given telescope in one and the same direction, the greater the extent of the sidereal universe in that direction. It can only be said to have failed in *this* respect, that it showed the incorrectness of the assumption on which it was based. Herschel found that a great increase in the number of stars seen in particular directions may arise—and in many cases certainly does arise—from the clustering of great numbers of stars in their particular regions of space—a condition of things of which his preliminary assumption had taken no account.

But while this involved the utter failure of the process of measurement which he had proposed to apply to the stellar universe, it by no means implied the failure of his observations to reveal any new truth. On the contrary, the very circumstance that he had to give up his preconceived idea of stellar distribution shows that a quite unexpected discovery had rewarded his star-gauging labours. He had been able to demonstrate the clustering of stars in particular regions of space, and therein lay a discovery of extreme interest.

Herschel's second method of gauging the heavens was based on the assumption that the greater the telescopic power required for the resolution of the milky light of the Galaxy into discrete stars, the greater the extent of the sidereal universe in the direction thus explored. This method also failed; but it only failed in *this* sense, that it showed the assumption Herschel had thus made to be incorrect. In some regions of small extent he found the resolution of the milky light to begin with his lowest powers and continue until his highest were used, milky light even then still remaining unresolved. And although he did not himself note the point, it is manifest that this, if his original assumption had been sound, would have signified the existence of long spike-shaped projections of stars from the sidereal system, all these projections, by an incredible chance, being directed exactly from the solar system. As such a supposition cannot be accepted for an instant, it is manifest (though Herschel, then in extreme old age, did not notice this), that there must be a clustering of stars of many orders of real magnitude within particular regions of space,—a condition of things of which Herschel's second preliminary assumption had taken no account.

But here also, while the complete failure of this second process of measurement was involved, this failure by no means implied the failure of Herschel's observations to reveal new truth. Here, as in the other case, the very circumstance that a certain idea of stellar distribution had to be given up, showed that a discovery of importance had rewarded Herschel's labours. He had been able to show that the clusterings of stars already demonstrated was not a clustering of stars nearly equal in magnitude, but of stars differing enormously in real size. Some of the rounded clusters thus examined by Herschel are so limited in extent that, assigning to them a roughly rounded real form (inferable from their obviously rounded apparent form), we see that the farthest parts of these clusters are not farther away than the nearer parts in greater degree than as 100 is greater than 99. But within these narrow limits of real distance Herschel found differences of stellar size and resolvability, through some eighteen star magnitudes, which would have corresponded (had his assumption been true) to distances differing much more than a hundred differs from unity. The discovery that within rounded regions of the stellar universe there may exist so many orders of suns, the largest exceeding the smallest thousands of times in volume, was of extreme interest, and threw an entirely new light on the architecture of the sidereal system.

In like manner it is to be noticed that Herschel's observations of star-clouds or nebulæ, although by no means to be interpreted as he had at first supposed, are most important in their bearing on our ideas respecting the structure of the sidereal system. He regarded the nebulæ as outlying universes resembling our own galaxy,—a grand idea justifying what is said on his tombstone, that he had broken through the bounds of our heavens,—*Cœlorum perrupit claustra*. It is however certain in reality all these star-clouds are within the limits of our sidereal universe. Herschel's own principle of interpreting his observations, though inadequate and inexact, suffices to prove so much as this. It is certain that with his most powerful telescope he was unable to reach the limits of our galaxy; it is manifest, therefore, that he could not see with them the individual stars or even the milky light of galaxies lying far beyond those limits. Therefore all the nebulæ observed by him were within these limits. There is no possibility of escaping this conclusion, unless we admit the possibility that there exist outside our galaxy others consisting of enormously larger and more brilliant stars—stars thousands of times larger than Sirius and Vega, which are themselves at least a thousand times larger than our great and glorious sun.

Of course, all these results may be said to have been proved at one stroke by Sir John Herschel's observations of the *Nebeculæ* or Magellanic Clouds. He found in *those* rounded regions (i) immense *numbers* of stars, indicating enormous range in distance if his father's first gauging principle is accepted; (ii) immense varieties in the sizes of stars (from

the 7th to stars so faint that in his powerful gauging telescope they could not be individually seen), and this according to his father's second gauging principle indicated also enormous range in distance; and (iii) great numbers of nebulæ of all orders, indicating, if his father's views about nebulæ were sound, that beyond each of the Magellanic Clouds, but separated from them by enormous distances if unoccupied, lie immense numbers of galaxies of suns forming two systems of such galaxies so situate, by an incredible chance, that they seem to correspond exactly in shape and position with the Nubeculæ. All this is certain, if the older methods of interpretation are insisted upon. "The access to the Nubeculæ on all sides," says Sir John Herschel, "is through a desert," "Intensely poor and barren regions," he says of those spaces which surround these Magellanic Clouds. In directions, then, all round the Nubeculæ the limits of the galaxy are very near,—according to both the gauging principles of Sir W. Herschel. Again the Nubeculæ are absolutely richer than any other parts of the heavens in nebulæ, which here form apparently two clouds of star clouds, coinciding in extent with the Magellanic Clouds. If these nebulæ are outlying stellar universes, they must lie at enormous distances beyond the Nubeculæ, yet appear to be coincident in shape and position with them,—a thing as incredible as that clouds in the sky should have precisely the same shapes and positions as dust marks on the pane of glass through which I see these clouds.

(To be continued.)

CHAPTERS ON MODERN DOMESTIC ECONOMY.

IX.—THE FRAMEWORK OF THE DWELLING-HOUSE (*continued*).

GENERAL PRINCIPLES OF CONSTRUCTION.

THE earth and ash systems for the treatment and utilisation of household refuse products are so very important in the economical management of a healthy home, that we desire to lay special stress upon the subject in this consideration of the principles of its application, and we cannot do so more conclusively than by a direct appeal to facts which have come under our notice, and which are alike as interesting to the specialist as to the seeker after general knowledge.

Before we proceed to quote our instances in support of a summary of conclusions, it may be as well to draw the attention of our readers to a novel and noteworthy method for the disposal, to advantage, of house slops, sink water, &c., in an ordinary abode, which, although not strictly included within the area of our immediate field of observation, is most closely allied thereto. It has often been objected, in discussions upon the merits of the earth and ash systems, that they do not deal adequately with the aqueous waste of the household. Hitherto, servants have been in the habit of pouring house slops into the basin of the prevalent water-closet, and would therefore be tempted, in the event of the universal introduction of the other plans, to do the same thing, with the disastrous consequences of a foul deluge. This, however, does not actually happen to any alarming extent, as we shall show hereinafter. It is worthy of notice, at all events, and more specially to suburban householders with suitable garden land, that what we have termed the "aqueous waste-products" may be turned very simply to actual beneficial account and in the following manner:—

"Where there is a garden adjoining the house the slops, &c., may, in most cases, be turned to good account, and may be removed from the house without the least annoyance, by the use of Field's Patent Self-acting Flush-tank. Let all the slops fall into this tank; let the drain from the tank to the garden be of well-jointed, glazed socket-pipes; let it empty itself into a small tank, about 18 in. deep, 1 ft. wide, and of such a length as may be necessary; let the surplus rain water from the roof also enter this tank. Out of it lay 3-in. common drain-pipes, 8 ft. apart, and 12 in. below the surface. Lay mortar at the top and bottom of the joints of the pipes, and leave the sides open. The liquid oozes through the sides of the joints of the drain-pipes and penetrates the surrounding soil; and the result is something fabulous. This simple plan will effectually deal with the slops, there being involved thereby neither smell, nor risk of poisoning the atmosphere by foul gas; and thus house-slops and sink-water may readily be turned to profitable account.

"In a garden where this plan has been adopted for eight or ten years, the pipes were recently taken up in order to see how far they might have been filled with the mud of subsidence. After so long use, very little mud was found, and none to prevent the working of the system, excepting where, in one or two places, the bad laying of the pipes caused some slight obstruction."*

It is obvious that the above-mentioned plan will become widely adopted wherever the earth system is established, and wherever it can possibly be applied. But there are numerous instances where it can never be called into action, and then due care must be taken in the separation of inoccuous from excrementitious products, and the committal of the latter into the soil-pail or vault. This is, perhaps, the only flaw of any magnitude in the earth system, but it is one which habit will, in the course of time, entirely eradicate, when servants and others will learn through necessity to become more methodical in their household duties, and gradually substitute well-regulated for slovenly customs.

Legal obstacles to the introduction of the earth and ash systems have ceased to exist since the incorporation of the "Sanitary Amendment Act" of Parliament,† and they can, therefore, be put into operation in any suitable locality either on a large or on a small scale. They are specially applicable to the wants of schools, factories, asylums, and other small communities of persons. On sailing vessels and yachts the supply of earth and ashes can be readily provided for, even on very long voyages, and thus dispense with the obnoxious system now in use everywhere. Towns and villages can also be adequately dealt with, so that there is no ground for reasonable excuse anywhere except in very large cities, where the reform must necessarily be gradual, and that because of pecuniary difficulties at the outset.

We shall now give an outline of the value of the system, gathered from actual reports upon its practical working in what may be regarded as typical examples. Dr. Buchanan, in his report "On the Dry-Earth System of dealing with Excrement,"‡ says:—"As regards the principle of the earth-closet, the evidence as to the powers of dry earth is unequivocal. If about a pound and a half of suitable earth, carefully dried, be thrown over a dejection all smell from it is forthwith removed; and if the same quantity be mixed with half a pint of urine the latter is absorbed. The mixture of the earth with stool and urine is not only in-

* "Moule's Patent Earth System," London, 1884, p. 22.

† July 31, 1868. Cap. cxv. sect. 70.

‡ "Appendix to Twelfth Report of the Medical Officer of the Privy Council, September, 1870."

offensive when fresh, but remains so after keeping for two or three months, or longer."

"The process which goes on in the mixture is obviously one of disintegration, and of some combination between the earth and the organic matter, as is evidenced by the disappearance of stools and even of paper among the other constituents of the compost. But the absence of fœtor from the mixture of earth with stool or urine, even with prolonged keeping, shows that decomposition in the ordinary sense does not take place." He then goes on to state that the various forms of earth-closets, used either within or out of the house, which have come under his careful observation, have always been found to be quite wholesome. This may be taken as ample testimony to the effective working of the system in the isolated dwelling-house.

As a second instance, we may consider its value when applied to large institutions and temporary gatherings of prolonged duration. In quoting from the reports of Dr. Buchanan, we may here make use of two special examples, which will serve to point out advantages of cardinal virtue in the exhibition of the system. In commenting upon the Dorset county school at Dorchester, where provision has gradually been made since 1865, he says:—"When the school was furnished with water-closets, the cost for repairs of them used to exceed £3 a-year. In the four years since the adoption of earth-closets, the entire charge for repairs has been less than 10s. Under the water-closet system there were frequently offensive smells, and diarrhœa was occasionally epidemic. Since the introduction of the earth system, there have been neither offensive smells nor diarrhœa. In 1866 and 1867 there was a good deal of 'low fever' in the parts of Dorchester round the school, but there was none in the school itself." Again, with regard to the Broadmoor Criminal Lunatic Asylum, he observes:—"Upon my visit on Dec. 29, 1869, several urinals were found to have their water-supply frozen up, and smell was coming from them. But the earth-closets were in most instances quite free from smell, although where they had been misused by slops thrown into them (in a part of the establishment where their use was most recent and least understood) there was some smell from them.

"P.S.—March, 1870. The closets in this and other parts of the asylum are now found in perfect order, without the least smell from any one of them. The opportunity of the frost, however, enabled comparison to be made with what must necessarily have been the condition of water-closets under similar conditions of use. The earth-closets, when properly used, were clean and odourless; water-closets without water, used by more than ten persons each, must, however carefully used, have been foul and offensive. Moreover, the Superintendent informed me that £70 had been paid for repairs to the water-closet pipes after a hard frost some few years ago, whereas under the earth system frost can do no mischief. . . . . A saving of water, estimated by Dr. Meyer to amount to nearly half the quantity previously used, and involving a corresponding economy in coals and pumping, is also to be considered in relation to questions of cost. Such economy of water was, indeed, one of the reasons for the substitution of the earth for the water system."

In our next communication we shall consider the value of the process in relation to other types, such as its application and results in relation to villages and towns, with specially interesting examples, and a concluding summary.

ERRATA.—On p. 499, col. 2, line 9 of the article on "A Marvellous Little Stream," the word "agnite" should be "augite." On p. 500, col. 2, lines 3 and 4, the dash ' should be transposed from the second E to the first.

ELECTRO-PLATING.

By W. SLINGO.

XVI.—IN THE BATH AND OUT OF IT.

THE objects destined to receive a coating of silver having been duly suspended from the cathode (the rod in connection with the zinc pole of the battery) and immersed in the electrolytic bath, and the battery circuit having been completed, attention must be centred on the bath and its behaviour. It is possible that, after every conceivable precaution has been taken in the preparation to ensure success, failure will ultimately result, unless due regard be paid to the efficiency with which the various parts of the bath continue to perform their respective functions.

It is noteworthy that when a solution is first used, its action is somewhat irregular, and may possibly lead one to think that something is radically wrong. This trouble, which is probably due to mechanical or physical inequalities, soon disappears, and, if all is as it should be, the deposition of the metal will proceed with becoming regularity, and give every satisfaction, for a time at least. In a previous article it was intimated that a quantity of free cyanide of potassium should be present in the solution for the purpose of facilitating the conversion of the silver plate forming the anode into the cyanide of silver. Now, the cyanide of potassium is assailable by carbonic acid, which converts it into the carbonate of potassium, while hydrocyanic acid is set free.

It is well-known that our atmosphere contains a proportion, small though it be, of carbonic acid, and it is this acid which acts deleteriously upon the cyanide, converting it into carbonate of potassium, in consequence of which the solution has a tendency to become weak in silver. In order to maintain the solution in good working order, a little additional cyanide of potassium should be poured in from time to time. The necessity for this additional cyanide is evidenced by the altered appearance of the silver plate, which, under favourable circumstances, has the characteristic pure white tint, but when the free cyanide has become neutralised, it is converted to a dirty or dull grey colour. The metal is less readily dissolved, and the action of the bath becomes sluggish.

Temperature, it will be evident on reflection, has a considerable influence on the quality and rapidity of the working, seeing what an immense part heat plays in varying the degrees of solubility for all kinds of substances in all kinds of solvents. Experience shows that the temperature at which the best action takes place is about 60° Fah. The quality of the deposit is considerably improved and its regularity largely increased by imparting motion to the object while it is in the cell. If constant motion cannot be maintained, an intermittent one, even if only at long intervals, should be imparted. If a solution be kept perfectly still, having immersed in it a plate of silver and a plate of, say, copper, connected to the copper and zinc poles of the battery respectively, it will be found that the upper part of the silver will be very extensively dissolved as compared with the lower part, while the densest deposit occurs on the lower part of the copper. This, at first sight, would appear to indicate that the electrolytic action takes place diagonally. A little reflection will, however, make it apparent that this is not necessarily the case, but will make it evident that the real cause is involved in a simple question of specific gravity. The cyanide contiguous with the silver dissolves it, and the liquid being thus much heavier falls. At the surface of the copper, silver is withdrawn, and the solution being proportionately lighter rises. Copious deposits are, therefore,

XUM

made on the lower part of the copper, and, as we approach the surface of the solution, the proportion of deposited silver gradually decreases. It will be also apparent that a smaller quantity of silver will, under these circumstances, be deposited in a given time by a given battery, and that, in fact, a weaker current is passing than would be the case were the silver precipitated uniformly. This uniformity is accomplished by imparting motion to the copper, and so stirring up the solution. In this way the amount of deposited metal may be increased as much as 15 per cent, and a corresponding increase in the strength of the current flowing will also be noticed.

A strong solution, containing only a small proportion of water, conducts well, and rapidly produces a rich, silky deposit, but it has the disadvantage of aggravating those troubles to which reference has just been made, and great care is necessary in managing the cell. The cathode becomes covered with a series of variously-coloured deposits, ranging from a good silver tint to lilac, or even to brown. Frequent stirring will, in a great measure, prevent this; but perhaps the safest way is to weaken the solution by the addition of a little more water, when it becomes much more manageable, albeit a little slower.

Sometimes it may be observed that the anode is being dissolved much more rapidly than the cathode is being deposited upon. This is a pretty sure indication that an excessive quantity of cyanide of potassium is present, in which case the addition of cyanide of silver will, in all probability, effect all that is desired. A little additional water may, however, also improve matters; but dilution to too great an extent should be avoided, as the deposit, which naturally forms slowly, assumes an unpleasant dead white appearance. The addition of cyanide of silver and cyanide of potassium will soon put matters right in this direction.

When the requisite amount of silver has been deposited, the object is dipped into a cyanide of potassium solution, and then well washed in a stream of water or under a tap, and the washing continued until the whole of the depositing liquid is removed. The object is then dried, and a trough of box-wood or mahogany sawdust having been heated, the object is placed in it and rubbed gently with it to ensure perfect dryness. It is then subjected to the scratch-brush process to rub down the burred surface produced by the depositing process. Bath-brick applied with a stiff hair-brush may, however, be substituted for the scratch-brush. The polishing (with rottenstone, &c.) and burnishing (with steel or agate burnishers) has then to be gone through. These are processes which are only learned by practice, and which it would repay the student to cultivate and practise frequently. They impart a charm to work which might otherwise look dull and uninteresting. It will sometimes happen that, although every precaution may be thought to have been taken, nevertheless some little necessity for cleanliness has been overlooked. The result is, that the application of the scratch-brush causes the silver to strip off in such places, and manifestly the work, perfect as it may otherwise be, is effectually spoiled. There is no help for it, save to remove the whole of the silver, make the new-exposed surface of the article smooth by rubbing it with Water-of-Ayr stone, and then to replate it. It may also be mentioned here that a similar process may be adopted in order to replate old work from which the silver has been more or less rubbed off in ordinary usage. To remove the silver the article is placed in a stone vessel containing some strong sulphuric acid, to which a few crystals of nitrate of potash have been added, and which has been raised to a high temperature. The nitrate of potash, or saltpetre as it is more commonly called, dissolves in the acid, and the solution dissolves the silver off the article. Care must be taken not to leave the object in the solution too long, otherwise it will stand a good chance of being entirely spoiled. If the silver is not readily dissolved, a little more saltpetre should be added, when the desired effect will be produced. If much of this sort of work is done, the solution becomes exhausted and crystals are deposited on the bottom of the vessel. As a considerable quantity of silver is present, an effort should be made to "recover" it. This problem, however, must be deferred for a fortnight.

CHATS ON GEOMETRICAL MEASUREMENT.

By Richard A. Proctor.

THE CONIC SECTIONS.

(*Continued from p.* 497.)

A. We have now to deal with the parabola.

M. Let A S L (Fig. 3) be the axis of the parabola A P K; S the focus; K L perp. to A L. We have to

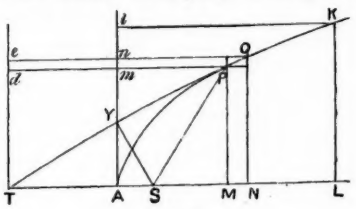

Fig. 3.

determine the area A Q K L. Take P Q adjacent points on the curve (which means points pretty near each other) and draw P M, Q N perp. to A L. Now we may conveniently try the properties of parabolic tangents, because we know that they are related to the lengths of such lines as P M, A M, &c., which are manifestly involved in our problem. We draw the tangent P Y T cutting A Y l the tangent at A (perp. to A L) in Y. Join S P, S Y, and draw P m d, Q n e, K l perp. to A l, and T d e perp. to T A L. Then T P Q is a straight line, when Q comes near enough to P. Hence the strips P N and P e, being complementary parallelograms, are equal. But we know that P d = 2 P m :* hence the strip P e is double the strip P n in area. Wherefore the elementary strip P N is equal to twice the elementary strip P n. Dividing up the whole areas A P K L, A P K l into such areas as P N, P n (by taking a multitude of points like P, Q, along A P K), we have each such area as P N in A P K L double the corresponding area as P n in A P K l. Hence

the whole area A P K L = 2 the whole area A P K l

and parabolic area A P K L = $\frac{2}{3}$ rectangle A l K L.

A. That is a simple result. This is, in fact, the first case in which you have shown an area bounded by a curved surface to bear a simple proportion to a definite rectangle.

M. You must not often expect such a result.

A. You have discussed, satisfactorily enough, particular areas taken from the ellipse and the parabola; but is it not possible to determine the area of any segment of either curve?

* By a well-known property S Y is perp. to P T, and as P T bisects the angle S P d, ∠ S P T = ∠ d P T = ∠ P T S. Wherefore S P = S T, and P Y = Y T. Hence P m = m d. But the equality of A T and A M is really a fundamental property of the parabola.

M. It is not only possible, but easy. For instance, I shall leave it to you as an exercise to establish the two following cases:—

(1) P L P′ (Fig. 4) is a cloud cutting the axis A A′ of the ellipse A P A′ in L; M P Q, N P′Q′ are ordinates (perp. to A A′) to the auxiliary circle Q A Q′; Q Q′ will evidently pass through L. Show that,

Elliptical sequent P A P′$=\frac{b\,C}{A\,C}$. Circular sequent Q A Q′.

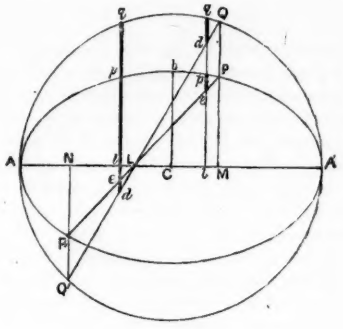

Fig. 4.

The proof consists in showing that any straight line being drawn as $q\,p\,l$ perp. to A A′, the part $p\,e$ lying on the elliptical area bears to the part $q\,d$ on the circular area, the constant ratio b C to A C.

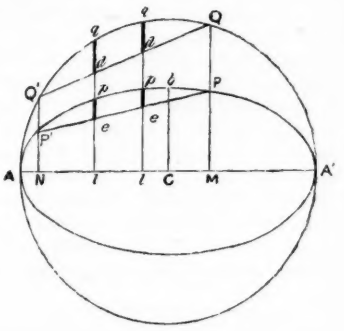

Fig. 5.

(2) Prove the like as to the sequents P p P′, Q q Q′, in Fig. 5 (in which Q′ p' N, $q\,p\,l$, and Q P M are perp. to A A′).

[The proof is similar to that of case 1,—note that P P′ and Q Q′, produced, meet on A A′ produced.]

(3) Prove that the parabolic segment P a P′ (Fig. 6) is equal to two-thirds the parallelogram P $l\,l'$ P′, when $l\,a\,l'$ is the tangent parallel to P P′, and therefore a M, parallel to the axis, is the diameter of the chords parallel to P P′.

[The proof consists in showing that $p\,y\,t$, tangent at p, is bisected in y, and hence that the elementary area $p\,m$, parallel to P M, is twice the elementary area $p\,n$ ($p\,n\,d$ being parallel to a M)].

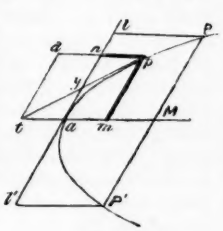

Fig. 6.

(To be continued.)

TRICYCLING IN 1884.

BY JOHN BROWNING.

Chairman of the London Tricycle Club.

WHAT WE GAIN BY USING THE TRICYCLE AS A MODE OF LOCOMOTION.

IN the very thoughtful article published by Dr. Richardson, in *Longman's Magazine*, he claims for the tricycle that, "it has doubled his power of locomotion." Before the successful application of two speed gearings, as applied to these machines by Burdess, Bowns, Hirst, and the St. George's Foundry Co., I should have agreed entirely with this claim.

My own walking powers being considerably reduced in the last twenty-five years, I cannot walk, without overtaxing myself, more than thirty miles in a day, at the rate of about three miles in an hour.

At the beginning of this year, I should have said that I could not ride a tricycle more than sixty miles in a day, at the rate of six miles an hour.

For, while last year I found about eight or nine hours' riding at the rate of about seven miles an hour as much as I could conveniently accomplish, this year I have ridden for nine hours at the rate of upwards of nine miles an hour, and I only left off then because it was dark and I could not get a companion to ride with me any further or I would have ridden three hours more at the same rate of speed.

But even eighty-two miles in nine hours may fairly be said to be three times my power of locomotion unaided by a tricycle.

Again, as regards speed, I could at one time walk for hours at the rate of five miles an hour; then, the tricycle would barely have enabled me to double my pace. Now that I cannot walk more than three miles an hour for any length of time, and yet can well ride at the rate of nine miles an hour on my tricycle without difficulty, my pace is clearly trebled.

From this I deduce the conclusion that the weaker a man is, the greater advantage he will gain by riding a tricycle.

After about nine months' experience on specially light machines, with wheels not larger than 40 in. in diameter, geared up to from 48 to 56 in. for speed, and down to from 28 to 32 in. for power, I can honestly affirm that the *tricycle has trebled my power of locomotion.*

Many persons have applied to me during the last three years to advise them respecting the adoption of a tricycle, stating that they were weak men, and they feared they were not capable of the exertion of riding one. I have had the pleasure of seeing or hearing from many of these gentlemen during the present year, and in no single instance have I yet heard of one of them relinquishing tricycling on the score of weakness, while several have expressed their great delight at finding they could ride so far and so easily.

As regards the power of locomotion when encumbered by luggage or carrying of weights in any form, the gain in using a tricycle is much greater. In Starley & Sutton's "Coventry Chair" an untrained man acting as a driver carried another man weighing twelve stone, or one hundredweight and a half, from Coventry to Birmingham and back, a distance of thirty-five miles, at the rate of eight miles an hour. What time would it take him to transport such a weight to such a distance without the aid of a tricycle?

And now that two-speed gearings have done so much for us, much requires more.

I have found great difficulty in advising the best proportions for two-speed gearings. For weak riders I have advised gearings equal to 35 and 50 in. For moderately-good riders, 40 and 55 in. These last are the gearings I prefer to any other for my own riding, while for strong and well-practised riders I believe gearings of 45 and 60 in. to be the most suitable.

But even these variations of power and speed-gearings leave much to be desired. Gearings well suited for dry roads will be too high for wet ones. Or a very strong wind will render them too high, if it is against the rider, and too low when the wind is in his favour.

If we could have three gearings instead of only two, and these were arranged so as to be equal to wheels of 30, 45, and 60 in. diameter, I believe that a machine so geared would suit any rider over any road, and in any kind of weather.

It does not seem to me that it would be very difficult to fulfil these conditions. It might be done with a modification of some of the gearings now in use.

Wheels might be used of 45 inches diameter, so arranged that these would, at all times, be driven without the intervention of the gearing, then, by turning a spade-handle to the left, the gearing might be thrown in of 30 inches, or to the right the gearing of 60 inches.

Speed and power-gearing have yet to be applied to tricycles specially made for carrying weights, such as Singer's "Carrier," &c. They will be even more advantageous to such machines than they have been to machines made only for riding.

I should not be surprised if the further improvement of the tricycle, particularly with the addition of some form of universal gearing, were to enable riders trained from boyhood, as many will be, to ride, to increase their power of locomotion fourfold.

I have known many strong active young men who could, only with considerable difficulty, walk thirty miles in a day, who might, I believe, with a very light and perfect machine, and plenty of practice, have ridden 120 miles more easily than they would walk the thirty.

The next step to be taken to increase the speed of tricycles is to make them with wheels of from 36 to 40 inches diameter, and gear them up to from 55 to 60 inches. Such an alteration in the construction of the machine I have been advocating in KNOWLEDGE for quite two years.

The success which has attended the introduction of safety bicycles, with wheels only 36 inches diameter geared up to 63 inches, is an earnest of the success which must attend such a construction of the tricycle.

But what we gain by using the tricycle as a mode of locomotion cannot be considered as comprised in the mere statement of the amount of ground we can get over—those who live in populous cities gain purer air, while with others they gain the delightful pleasure of viewing a greater variety of scenery—the exhilaration caused by "the glory of rapid motion," and, above all, greatly improved health and strength arising from the fact that tricycling is a far more beneficial exercise than either walking or running.

All who are interested in tricycles will be glad to hear that the Stanley Show will be held next year in a building which will be erected for the purpose on the Thames Embankment, near to the Temple Station of the District Railway.

The date fixed for the opening is January 28, and the Show will close on February 3. The building will probably be known as the "Wheeleries." The central position of the Show, and the fact that its managers pledge themselves to exhibit all the novelties and a machine of every standard pattern render its success certain.

Editorial Gossip.

A WELL-KNOWN scientific knight, being asked the other day what the letters F.R.S. after his name meant, responded, "F.R.S.? Why, 'fees raised swiftly.'" I repeat this perfectly true anecdote to express my admiration of the truthfulness of the reply, and my regret that some more of the gentry who annually acquire the same distinction as he has done are not equally candid.

A CURIOUS commentary on the hysterical shrieking of the (happily small) band of fanatics who are monomaniacal on the subject of vivisection was afforded by an operation which was performed some five weeks ago by Mr. Rickman J. Godlee, surgeon to University College Hospital. Physiologists are familiar with the experiments by Professor Ferrier on rabbits and monkeys, by the aid of which he was enabled to localise the sensory and motor functions in the cerebrum. Now, it came to pass that there was a patient in the Regent's Park Hospital for Epilepsy and Paralysis, a married man, with a family, stricken down with that—heretofore—fatal malady, tumour on the brain: a malady of the mere existence of which the diagnosis had not presented much difficulty, though, prior to Ferrier's splendid researches, it was simply impossible to *localise* the seat of the tumour. Guided, however, by the unerring hand of science, Dr. Hughes Bennett was so successful in the interpretation of this poor creature's convulsions as to be able to say definitely that the tumour was situated in the ascending frontal convolution of the right hemisphere of the brain. Down through the scalp, the skull, and the dura mater did Mr. Godlee cut to the point indicated by Dr. Bennett—and there was the tumour, the size of a walnut, which was removed without difficulty! Surely the moral of this story needs but little insisting on. Here was a man, who, but for the flood of light cast in his case by the experiments in vivisection of Dr. Ferrier, must infallibly have perished miserably, and left a widow and orphans to the cold charity of the world. Thanks, however, to those experiments, he has been restored to health, strength, and usefulness; and who shall say that the lives of a thousand rabbits have been wasted in the attainment of so glorious a result?

FROM time to time we see reports of prosecutions in the police-courts of cheesemongers and others for selling as butter a compound known as oleomargarine, butterine, or "bosh." I was rather amused to see that a large manufacturer of this material had been endeavouring to convince the Society of Arts that—on the whole—it is rather preferable to pure butter as an article of consumption; *inter alia*, keeping better and being much cheaper. Certainly, as described by the lecturer, the "butterine," composed, as it is, mainly of fresh and sweet animal fat, and manufactured under conditions of the most scrupulous cleanliness, should be as good as a very large proportion of, say, the "inferior Dosset" of the undying Mr. Middlewick. For myself, however, I have a weakness for a more primitive article, though I should be very sorry to obtrude this opinion on anyone who preferred a round of oleomargarined toast. It is related that one of a party of convives, early in the century, carefully removed all the flies from the punch-bowl, helped himself to punch . . . . and then returned the flies to the bowl. "What," exclaimed his next neighbour, "what the doose did you do that for?" "Well," was the reply, "I don't like flies myself, but I didn't know but what you might!"

TAKING up a number of the *Queen* the other day, my eye fell on an article by Lady John Manners, on "Some of the Advantages of Easily Accessible Reading and Recreation Rooms," through which I took the pains to read, to see whether its authoress had anything really instructive to say upon the subject. I was, I confess, terribly disappointed. Her idea of a reading-room for the industrial classes—or rather of its literary furniture—would seem to be that a very considerable proportion of the books should be of the "goody-goody," or "I say untoe you, my brethren," order. She gives, however, quite candidly, the name of the highly-respectable firm of booksellers whose representative has been her adviser in this matter. That a working man or woman should ever care to know anything of the structure of the Celestial Vault and the glories of the illimitable universe; of the strange story of the manner in which our own earth has developed through untold millions of years; of the theory of the lightning-flash; of the causes and circuits of the wind; of the marvellous details of the animal frame; of the wonders of chemistry, electricity, and optics; of the life and growth of plants, and of innumerable cognate marvels which encompass us, never seems to have entered into Lady John Manners's mind for an instant.

SPEAKING of the *Queen*, by the way, its so-called fashion pictures cannot fail simply to disgust every one who has the slightest artistic taste, or reverence and admiration for the exquisite contour of the human form. Every woman in them seems to be suffering from steatopygia in an aggravated and offensive form. I have myself always heard that the Hottentot Venus was a most unpleasant sight, and that, however curious from an anatomical point of view her deformity was, it was most repulsive to look at. Now, if I may judge from the engravings of which I am speaking, females more or less weak-minded seem to be endeavouring, as far as they can artificially, to copy this peculiarity accurately. I say "females," because I note that all these exaggerated fashions are what a friend of mine calls "suburban," and that ladies in the very best set eschew them altogether.

WITH the present issue of KNOWLEDGE the seventh volume is commenced, and a fitting opportunity is presented for submitting an outline of our programme, so far as it has been arranged, for the year just commenced. Mr. Grant Allen's interesting papers on Natural History will be continued, as will also those on Geology, by Mr. Harrison. Mr. Clodd's series on Dreams, now completed, will be succeeded by a popular series on Evolution; and Mr. Foster will deal with Social and kindred matters as occasion requires. Mr. Slack's Microscopical Studies will be continued; Mr. Butler will substitute for "Pond Entomology" a series of articles on "Household Insects;" and Mr. Mattieu Williams will presently turn his attention from the "Chemistry of Cookery" to the equally-important subject of the "Philosophy of Clothing." "A Working Man" will continue his useful papers on Household Carpentry, while Experimental and Practical Electricity will be dealt with by Mr. Slingo, and Optics, Natural Magic, &c., by a Fellow of the Royal Astronomical Society. Amongst the subjects to be taken in hand by the Editor may be mentioned those of Astronomy, Mapping, and Geometry. Whist, by "Five of Clubs," and "Chess," by "Mephisto," will continue to be regarded as characteristic features of the paper.

Reviews.

CUSTOM AND MYTH.

BY EDWARD CLODD.

(CONCLUDING NOTICE.)

IN returning to the leading *motif* of this book—namely, its protest in favour of the anthropological as opposed to the purely philological method, it must be conceded that the facts yielded by the former are overwhelming in its support, and derive their cumulative force from their universality in the lower culture.

The controversy which has become inevitable on this matter is even more distasteful to the present reviewer than Mr. Lang confesses it to be to himself, since it involves disagreement with the distinguished scholar whose "Lectures on the Science of Language" led many of us, weary of word-mongers, for the first time by pleasant ways into the seemingly arid region of philology, and who has done so much to enkindle interest in the profounder subjects of man's religious development and destiny.

But "truth must be preferred to Plato," and the dicta of Professor Max Müller may not pass unchallenged. In a discursive article under the title "Forgotten Bibles,"* a title which, except in the opening sentences, has no relation to the subject-matter, the Professor divides the modern school of inquiry concerning the origin and nature of language, myth and history, into the Historical and the Theoretical, contending that whilst the guiding principle of the former is "learn to understand what is by learning to understand what has been," that of the latter is, as the name given it implies, speculative, "reasoning *à priori*." Professor Max Müller then shows what success has attended the one in its endeavour to solve the problem of the origin and growth of language and of religion by the collection and comparison of accessible evidence from the Aryan group of dialects and from the sacred books of both Aryan and Semitic nations, and what failure has followed the other through its assumptions that interjections and imitative sounds are the rudimentary forms of speech, and that the barbaric assumption of life and personality to lifeless things is the foundation of belief in gods and other spiritual beings.

The distinction which the Professor draws between these two schools is artificial; had it any correspondence in fact, the titles given should change places. For, in all its inquiries, the school dubbed Theoretical adopts the scientific method. It works from the more known to the less known, from the familiar to the recondite. It is in bondage to no theories to which the facts it brings to light must also be chained. Embracing man in his *tout ensemble*, and unhampered by limitations of his antiquity, it draws no imaginary boundaries such as hem in the so-called Historical School. Its study of man, as myth-maker and fetish worshipper, extends far beyond the relatively late period of Vedic civilisation; for it the roots of his language lie deeper than we can fathom, far below the feeders of Proto-Aryan speech. (By the way, when may we expect a translation of that, thus far, "forgotten Bible," the "Rig-Veda," as the Veda *facile princeps*, to appear among the "Sacred Books of the East?" It is the Historical School which works on *à priori* lines, restricting its motto, "Learn to understand what is by learning to understand what has been," to what "has been" up to the Vedic age, but not beyond it. It is that same school which assumes in man at his lowest a faculty of "apprehending the In-

* *Vide Nineteenth Century*, June, 1884.

finite," as if this were a primal dowry of the soul, and which constructs its pictures of island dwellers to whom the ocean, of valley dwellers to whom the rivers, fed from mysterious sources, the protecting mountains with their inaccessible summits, and the over-arching sky were alike the Unknown, becoming in the end their God. And, with reluctance be it added, it is the Historical school which, limiting the area of its sympathies, flings the sneer at relics of a prehistoric past with their witnesses to an ascent of man, and misrepresents the anthropologists as making every fact fit into their immobile division of the ages of progress. Because, as a young student, Professor Max Müller witnessed the collapse of the empirical theories of development rife in Germany forty years ago, he predicts a like fate for the evolution theories of to-day. *Non sequitur.* But the Professor's prejudices are more damaging to his cause than his prophecies, when, speaking of the anthropological method, he says: "I differ from it; I have no taste for it. I also think it often very misleading."

It may not be to the polemical advantage of the Historical school, although it would prove its candour, that Professor Max Müller should conquer his distaste for the mass of evidence—much of it confessedly unsavoury—with which the "Theoretical" school supports its arguments. But the facts are there; facts as to the limitations and feeble vocabularies of barbaric peoples; as to their myths, often coarse and irrational; as to their religious customs, often disgusting and brutal; and they must be reckoned with, whether as degradations of nobler endowments and beliefs, or as arrested developments, or as the expression of germinal ideas.

Enough has been said to indicate the serious questions which are raised by Mr. Lang, and the settlement of which will determine whether the exclusive method which he controverts is to give place to that scientific method which investigates the history of man in the sum of his customs and beliefs throughout the world from remote times until now. As to the issue there can be no doubt.

But in reviewing the manifold subjects of abiding interest so luminously treated by Mr. Lang, it is to be regretted that he has not told us what residuum of truth he recognises in the solar theory so far as the results based upon philological evidence, upon terms in Greek and Sanskrit whose cognate likeness is proved, and upon the survival of anthropomorphic notions about nature, are concerned. This we may perhaps learn in a future volume, when the case against the comparative mythologists is stated in more related form. For the work before us is, as hinted at the outset of this notice, a series of articles more or less detached, sent out, like scouts, before the regular troops advance in well-ordered array. And in the day of conflict the sun will not stand still upon Gibeon, nor moon in the Valley of Ajalon to give victory to the solar mythologists. Mr. Lang's book is to be commended to the perusal of every student of the science of human progress.

SOME BOOKS ON OUR TABLE.

Darkness and Dawn, the Peaceful Birth of a New Age. (London: Kegan Paul, Trench, & Co. 1884.)—The first part of this altogether remarkable volume mainly consists of a string of vituperation (in pseudo-Ruskinesque) of existing social conditions in England. In the second portion, its author describes, in a species of prophetic vision, how all the evils from which we are now suffering were at once and for ever abrogated by the simple process of throwing everything into what lawyers call "hotchpot," abolishing all property, rights, and social distinctions, and making every man in the British Islands not only as good as every other man, "but," as the Irishman once observed, "a grate dale betther, too." That commercial morality is at a low ebb, that a vast amount of preventible suffering obtains among the working-classes, and that huge fortunes are made by those but ill qualified to benefit either themselves or others by such acquirement, we are assuredly not concerned to deny. Whether, though, Socialism, pure and simple, affords a panacea for such a condition of things, is, we think, in the very last degree doubtful.

Meister Martin. By E. T. A. Hoffman. Edited by Franz Lange, Ph.D. (London: Symons & Co.)—This quaint romance, giving a vivid picture of mediæval Nuremberg life among the members of a guild, is published in Messrs. Symons' "German Classics" Series. Professor Lange's notes on the idioms and grammatical construction of the work are one and all to the purpose, and will be found very helpful to the student of German.

Ward & Lock's Technical Journal. (London: Ward, Lock, & Co.).—Now that the system of apprenticeship is practically as dead as the Heptarchy, sound and efficient technical education has become an imperative necessity, unless, indeed, the English artificer is to yield the palm to his continental competitor, and his pre-eminence as a workman is to become a thing of the past. As a contribution towards the solution of this problem, and with a view to affording the means of self-instruction in the various details of the mechanical and industrial arts, Messrs. Ward & Lock have projected the work whose title heads this notice; and, should the remainder fulfil the promise of the first part now before us, it can hardly fail to supply a really valuable addition to the bookshelves of the young architect, engineer, builder, carpenter, metal-worker, manufacturing chemist, textile-worker, gardener—or, in fact, worker with his hands of every sort and description. An encyclopædic dictionary of technical terms promises to be a most useful feature in the new journal. It is profusely illustrated.

Hints for Invalids and Travellers, with Observations on the Climate of Luxor and Egypt. By T. S. Maclean, M.B. (London: H. K. Lewis. 1884).—All who, undeterred by our present little difficulties on the banks of the Nile, would visit the land of the Pharaohs for their health's sake, will find a quantity of useful information in Mr. Maclean's little pamphlet.

The Works Manager's Handbook. By Walter S. Hutton. (London: Crosby, Lockwood, & Co. 1885.)—Practical from beginning to end, Mr. Hutton has produced a book which cannot fail to prove invaluable to those for whose benefit it has been compiled—the managers of mechanical works of every sort and description. Into its 408 pages he has contrived to pack an amount of information which is quite remarkable. The work is divided into six sections, dealing, respectively, with (I.) Stationary and Locomotive Steam-engines and Gas-engines; (II.) Hydraulic Memoranda; Pipes, Pumps, and Water-power; (III.) Millwork: Shafting, Gearing, and Pulleys; (IV.) Steam Boilers, Safety-vales, and Factory Chimneys; (V.) Heat, Warming and Ventilating; Melting, Cutting, and Finishing Metals; Alloys and Casting; Wheel-cutting and Screw-cutting; and (VI.) Strength and Weight of Materials, Workshop Data, &c. Under every one of these headings the most recent information is supplied—for example, the weights of metals rolled to gauge are given in the New Imperial Standard Wire-gauge; the Birmingham Wire-gauge being now abolished by statute. One conspicuous merit in Mr. Hutton's volume, and one which will be readily recognised as such by all who make use of it, is the virtual abolition of formulæ from its pages, and the substitution of rules expressed in words, with worked-out examples. For there can be no doubt that, rightly or

wrongly, the average practical mechanic is repelled by a's n's x's $\surd$ and sin θ. As far as our examination has extended, we have found one comparatively trivial mistake, and one only, in the whole book. It occurs on p. 385, where the velocity of light is given as 192,000 miles a second, it being really only 186,600 miles.

Natural History Sketches among the Carnivora. By ARTHUR NICOLS, F.G.S., &c. Illustrated. (London: L. Upcott Gill. 1885.)—Obviously possessing a strong personal attachment to animals, Mr. Nicols cannot fail to inspire his readers with much of his own enthusiasm. Chatty in style, commendably free from technicalities, and brimming over with anecdote, his book introduces us, as it were, into the inner life of the Carnivora, and invests them with an interest which cannot fail to foster a taste for zoological study in the large numbers who will, we hope and believe, read his latest work. It is difficult to avoid contrasting a volume like this, full of interest from beginning to end, and illustrated with the most life-like engravings, with the wretched compilations of dreary, stereotyped little paragraphs and conventional woodcuts, bearing but the faintest resemblance to the animals they were fondly imagined to represent, which passed for "Natural History" in the days of our childhood.

The Magic Lantern and its Management. By T. C. HEPWORTH. (London: Chatto & Windus. 1885.)—In the plainest language Mr. Hepworth instructs the beginner in the use of the lantern; describes the various modes of illumination; explains the various sorts of screens, opaque and transparent, on which the image is thrown; tells us how to paint magic-lantern slides and to colour photographs for the same purpose; gives an account of the manner in which opaque objects are exhibited, and the lantern-microscope is constructed,—in fact, supplies a manual containing everything that is needed to make its reader an expert exhibitor of this very amusing and instructive optical instrument.

How to Use our Eyes. By JOHN BROWNING, F.R.A.S., &c. (London: Chatto & Windus. 1884.)—A portion of this work appeared in our third volume, but considerable additions have been made to this, and no less than fifty-four illustrations now elucidate the text. That Mr. Browning's entirely practical brochure supplies a real want may be inferred from the fact that it is the third edition, and fifth thousand of it, which lies before us. It furnishes exactly the kind of information required by every one whose sight is any degree failing; and to all such we commend its perusal.

Short Stories. Selected by J. M. LAINÉ, M.A. (London: Moffatt & Paige. 1884.)—Anything more hopelessly dreary than a collection of small anecdotal paragraphs when read through from beginning to end it would be hard to imagine. Mr. Lainé's selection, however, has been made for the benefit of children in the Fifth Standard in Elementary Schools, who are required by the Education Department to "write from memory the substance of a short story read out twice," and for this purpose it seems sufficiently well adapted. What, though, by a wonderful stretch of imagination, he calls "amusing stories," appear to us particularly depressing. Perhaps, though, it isn't very easy to be funny to order—even of "My Lords."

A Sketch of the Geology of Suffolk. By J. E. TAYLOR, Ph.D., F.L.S., F.G.S. (Sheffield: Wm. White. 1884.)—This reprint from "White's History of Suffolk" contains an account at once succinct and complete of the geology of the county of Suffolk. Its physical structure is described, and the palæontological characteristics of the various strata treated of. The localities famous for particular fossils are indicated, and, in fact, it may be regarded as a *vade mecum* for a geologist on his first visit to this part of East Anglia.

We have also on our table the *Tricyclist, Society, Bradstreet's, The Medical Press and Circular, The Second Annual Report of the Metropolitan Public Garden, Boulevard, and Playground Association, Ciel et Terre, The Doctrine of Life, The Dyer, Night and Day, The Sidereal Messenger,* and *Naturen.*

THE FACE OF THE SKY.

FROM JANUARY 2ND TO JANUARY 16TH, 1885.

BY F.R.A.S.

SPOTS and faculæ, though becoming rather less frequent, should be looked for whenever the Sun is visible. The night sky will be found pictured in Map I. of "The Stars in their Seasons." Mercury comes into inferior conjunction with the Sun on the 3rd, and becomes a morning star. He is about as badly placed for the observer as he well can be—a remark which applies with equal force to Venus. Mars is invisible. Jupiter rises between 8 and 9 o'clock when these notes begin. By midnight he is sufficiently high up to be well observed, presenting a splendid spectacle with adequate telescopic power. He is situated to the east of the star ρ in the constellation Leo ("The Stars in their Seasons," Map IV.). The phenomena of his satellites are now both numerous and interesting; and, as usual, we give those happening before 1 a.m. during the next fortnight. To-night Satellite II. will disappear in eclipse at 12h. 26m. 34s., as will Satellite I. at 12h. 32m. 10s. p.m. On the 3rd the shadow of Satellite I. enters on to Jupiter's face at 9h. 44m. p.m., followed by the satellite casting it at 10h. 43m. The egress of the shadow occurs at 12h. 4m., that of the satellite at 1h. 2m. the next morning. Satellite II. will begin its transit at nine o'clock at night on the 4th, but Jupiter will be so very close to the horizon that the observation of this phenomenon is doubtful. Fifty-eight minutes later, the shadow of the same satellite will leave Jupiter's disc. At 10h. 15m. p.m., Satellite I. will reappear from occultation by the planet. Satellite III. will reappear from eclipse at 11h. 5m. 30s.; only, however, to be occulted at 11h. 25m. Finally, the egress of Satellite II. from the face of Jupiter will happen at 11h. 55m. p.m. On the 8th the egress of the shadow of Satellite IV. takes place at 10h. 28m. p.m. On the 10th the shadow of Satellite I. begins its transit at 11h. 38m. p.m., followed by Satellite I. itself at half-past 12. On the 11th, Satellite I. will disappear in eclipse at 8h. 53m. 32s. p.m., but it is very doubtful whether this will be seen, so close will Jupiter be to the horizon. The shadow of Satellite II. will enter on to Jupiter's face at 9h. 35m., and that Satellite itself at 11h. 19m. Satellite III. will be eclipsed at 11h. 32m. 6s.; Satellite I. reappear from occultation at 12h. 2m. p.m., and the egress of the shadow of Satellite II. take place at 12h. 31m. On the 12th the egress of the shadow of Satellite I. will occur at 8h. 26m., but, for the reason once or twice previously stated, its visibility will be doubtful. The egress of Satellite I. itself takes place at 9h. 16m. On the 13th Satellite II. will reappear from occultation at 8h. 55m. p.m. Lastly, on the 15th, under unfavourable circumstances for the observer, Satellite III. will pass off Jupiter's face at 8h. 9m. p.m. Saturn is visible all night long. His rings are now almost as open as they can be, and it would be hard to imagine a more beautiful spectacle than the planet presents to the possessor of adequate telescopic power. No opportunity should be lost of observing and, we may add, drawing Saturn under the present exceptionally favourable conditions. He forms a rough isosceles triangle with β and ζ Tauri ("The Stars in their Seasons" Map I.) Uranus has not yet come fairly into view. Neptune may be found by the observer furnished with a sufficiently large telescope to the S.S.E. of δ and ζ Arietis (same map). The Moon enters her last quarter at 3h. 36·6m. a.m. on the 8th, and will be new at 8h. 36·5m. a.m. on the 16th. One occultation of a star only at anything like a convenient hour occurs during the next fourteen days. It happens to-night, when the 6th magnitude star B.A.C. 2872 will disappear at the Moon's bright limb at 7h. 10m. p.m. at an angle from her vertex of 344°, to reappear at 7h. 36m. p.m. at her dark limb at a vertical angle of 283°. The Moon is crossing Cancer to-day, and passes into Leo at four o'clock to-morrow afternoon. From Leo she descends into Sextans at nine o'clock at night on the 4th, to re-emerge in Leo at six o'clock the next morning. She finally quits Leo for Virgo at 6h. 30m. a.m. on the 6th; and it is 2 p.m. on the 9th before she has completed her passage across this great constellation. Entering Libra at the hour last named, she occupies until 3h. p.m. on the 11th before she reaches the boundary of the narrow northern strip of Scorpio. This it takes her eleven hours to cross; and at 2h. a.m. on the 12th she enters Ophiuchus. She leaves Ophiuchus for Sagittarius at 8 o'clock the same night; remains in Sagittarius until 2h. p.m. on the 16th, and then crosses into Capricornus, where we leave her.

"Let Knowledge grow from more to more."—ALFRED TENNYSON.

Only a small proportion of Letters received can possibly be inserted. Correspondents must not be offended, therefore, should their letters not appear.

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TO OBLIGE MR. KINNS.

[1547]—Mr. Kinns, apparently unaware that for the next few months I shall be in America (whence, however, I continue to conduct KNOWLEDGE in the fullest sense of the words), writes to me in considerable dudgeon because of my remarks respecting his views about "Moses and Geology," He wishes me, as I understand him, to withdraw my remark that the gentleman who kindly acts for me as editor in my absence, wrote "in good faith" what he said about Mr. Kinns's work. This, I need hardly say, I decline to do. I could not do it without gross untruth, which Mr. Kinns will excuse me from being guilty of. The Acting Editor has, in the fullest and clearest way, explained that a mistake, and a very remarkable one, which disfigured the first edition of the book and led to his comments, has disappeared from the second: and I have pointed out that there is nothing libellous or injurious in saying that a remarkable mistake respecting any particular scientific subject implies ignorance on that subject at the time when the mistake was made. I am grossly ignorant about a number of scientific subjects, and expect, if (misunderstanding some statement by an expert) I make incorrect remarks on such subjects, to find my ignorance pointed out and corrected. So far from regarding such correction as injurious, I recognise it as profitable. Mr. Kinns, in like manner, owes a debt of gratitude to whomsoever it was who first called his attention to the mistake in his supposition that refraction might bring a heavenly body into view round a whole hemisphere. This enabled him to expunge the mistake from the new edition, and to make quite a little noise over my friend's remarks based, in perfect good faith, on the belief that the error had not been removed. Why, Mr. Kinns profited by a perfectly splendid opportunity of advertising, for nothing, the increased value of the new edition of his book. He assuredly has had, in the long-run, small reason to complain, but quite altogether and absolutely the other way about.

Then Mr. Kinns wishes me to withdraw my remarks about a certain monstrous miscalculation. Well, I decline to do that either. I have the most perfect recollection of the mistake, which he was good enough to send directly to me—and I am told it is repeated in his book, in later as well as earlier editions. In fact, he himself refers to it in his letters to me. The mistake was this. He found fifteen statements in Genesis about successive creative acts. He found that these could be shown to correspond with fifteen stages recognised by various scientific men, writing in different fields of research, as belonging to the past of the earth; and that these stages, according to the views of certain among these scientific men, could be arranged in the same order as the fifteen corresponding stages which he found in Genesis. Wherefore, he reasoned in this marvellous way;—Fifteen things can be arranged in 1,307,674,368,000 different ways; the odds against a particular arrangement being taken at random are therefore 1,307,674,367,999 to 1. Therefore these are the odds in favour of Mr. Samuel Kinns's theory that the account given in Genesis presented in abstract the true sequence of events in the early history of our earth. The real facts are something like this:—First, not a man of science living would pretend to set in precise order any fifteen, or any ten, or any five stages of the early history of our earth; secondly the odds would be millions to one against the correctness of any attempt on the part of the whole scientific body of our day to mark out such a sequence as Mr. Kinns has indicated; thirdly, of each of the fifteen Bible statements he uses, it may be said that it will bear from five to twenty other interpretations than that assigned by Mr. Kinns. Taking on the average the chance that he would be able to fit three statements out of the fifteen with corresponding scientific views as about 4-5 (which is equivalent to making the chance in a single case rather better than 9-10ths), we find the chance of his fitting all fifteen statements in this way, equal to about 64,000 in 100,000, or the odds in favour of his doing so nearly 2 to 1. (Noting Mr. Kinns's keenness in the work I would certainly have backed him at long odds—100 to 1, at least—to manage it *somehow*). This is the chance of Mr. Kinns showing an apparent coincidence between the order of fifteen creative acts recognised *by him* in Genesis, with fifteen stages (recognised by *some* men of science) in the past history of the world, and by some of them set—three or four stages at a time, or so—in a certain order, out of which a suitable sequence of the fifteen (that is, suitable for Mr. Kinns's theory) may be constructed. The odds against any sequence thus constructed out of the very imperfect data being right, or anywhere near right, must be millions to one. Thus while the odds are strongly in favour of any one satisfying himself with a solution, who seeks for it as Mr. Kinns has done, the odds are overwhelmingly in favour of the solution so obtained being incorrect. He may be regarded as in a sense resembling Lady Tichborne, seeking for some one to represent her missing son. She did this in such a way that she was almost sure to come across a son in the long run, and that—if she did—she was *quite* sure to come across the wrong one.

Mr. Kinns further wishes me to withdraw my remark that his view with regard to the general question is monstrous. But unfortunately the more I think of it, the more monstrous it seems. In effect, he expects us to believe that an inspired writer—it really is a matter of perfect indifference whether Moses, or Samuel, or any one else—wrote an account involving fifteen statements about the past of the earth, in such a vague and unsatisfactory manner, that till Mr. Kinns came along and was good enough to explain matters, no one understood what the fifteen statements meant. Why this is almost as monstrous as the belief of the pyramidal folk that an Omniscient Being, with every conceivable way of communicating his will open to him, chose to have the Great Pyramid built at the cost of thousands of innocent lives—cemented with blood, one might say—in order that thousands of years after, when it had lost all the fineness of structural detail which had once characterised it, the pyramid should suggest to a few enthusiasts His plans and purposes, with regard to the whole human race.

RICHARD A. PROCTOR.

DICKENS'S STORY LEFT HALF TOLD.

[1548]—"J. B.'s" letter (1527, p. 471) about "Dickens's Story Left Half Told" takes so very prosaic a view of the story, that it seems hopeless to attempt to show that Dickens never could have had such a dull plot in his mind. Still less would he have described such a plot as "a powerful one," or again as "difficult to work out." I will note a few of "J. B.'s" mistakes in matters of detail, but I have no expectation of convincing him.

I do not make a great point of "the sight which solemnified Jasper," &c.; for I do not know what it was which startled him so. But I certainly reject "J. B.'s" prosaic interpretation. Possibly some look or expression of countenance showing Drood's real nature, earnest not frivolous, as Jasper and others fancied, may have been meant: Dickens would have made a point of such a detail as that. Neither do I pretend to say, or care to guess, how Jasper's attack was carried out; all *that* belongs to the commonplace sensational part of the story, not to the real interest of the plot.

It would have been part of the difficulty of the plot to explain how Drood had been so altered by the effects of the injuries he had received as to be capable of carrying out his plan of keeping close watch, in disguise, on one who knew Drood so well. If "Hunted Down" had been left unfinished, similar objections might have been raised against the true interpretation of that plot, too,—an interpretation which every one who really understood Dickens's ways guessed (in its general aspect, though not, of course, in details) from the outset. So with Carton's plan for saving Darnay,—we feel it, know even how it is to be done, that is, on what general idea the plan turns, yet one could not convince a commonplace reader that that was the plan, until or unless he had read on to the end. The way in which, early in the story, Carton asks Darnay if he does not think him unpleasant, satisfies every one who understands Dickens that Carton is to make some great sacrifice for Darnay.

"J. B." thinks that the attention drawn to Datchery would have detected Drood had he been disguised in that character. Attention would be drawn to Datchery's peculiarities, and, therefore, not *to*,

but *from* Datchery's resemblance to the missing man. Dickens knew well how easily a man may be disguised so that even his own friends shall not know him,—if he is disguised in such a way that attention is directed to peculiarities. Note how carefully even the keen Cavaletto had to watch before he detected the marked features of Rigaud under a comparatively commonplace disguise. "Fancy Drood sauntering about Cloisterham with a large grey wig on!" says "J. B." Well! fancy Rigaud-Blandois sauntering before his quondam fellow-prisoner disguised as an elderly man!

I contend, not that no one ever speaks of Drood as dead, but that the whole tone of Grewgious and Rosa implies that they know him to be alive. But I cannot make "J. B." catch the meaning of this tone, any more than a musician can show a person not possessed of musical knowledge that sounds coming from a band contain such and such tones produced by such and such instruments.

"J. B."agrees with "H. L." that the illustrations on the cover prove nothing, for "Dickens would not have published them" if they represent Edwin's escape and reappearance on the scene. Would he not? Have "J. B." or "H. L." never, by chance, seen the covers on the monthly numbers of "Martin Chuzzlewit" and others of his stories, or noticed how much of the development of the story was thus illustrated from the beginning? Dickens knew that readers not keen enough to see the working of his plot as he went on would find no meaning in such sketches, suggestive though they were to the keener sort. But, says "J B.," Dickens feared the story was being unfolded too rapidly. That fear was only expressed to Miss Hogarth when Datchery had already appeared on the scene, months after Dickens had instructed Fildes what to show on the cover (of course without giving Fildes the least inkling as to the meaning of these little pictures). By the way, it was I who called attention to the significance of Dickens's anxiety. Perhaps "J. B." or "H. L." can explain why Dickens should have spoken of the "Datchery assumption," if Datchery were not an assumed part, as the detective notion implies; or why, if Datchery had been a detective only, Dickens should have felt the least anxiety as to his plot being interpreted. If Datchery were only a detective, or indeed were any one but Drood, the progress of the plot might have been in any direction whatever; and certainly no light would have been thrown on the mystery. But Dickens knew that the detection of the identity of Datchery and Drood would indicate the direction of the plot to the very end.

Grewgious is at no time genial, "J. B." thinks. If Grewgious was not a special favourite of Dickens's and meant to be as much liked as Tom Pinch, or even better, I know nothing of Dickens's ways. Yet I cannot recall a single instance in which, when reading his later novels, I have failed to see from the beginning what Dickens meant each character to be. There were readers of "Our Mutual Friend" so dull as to imagine Silas Wegg a genial character; and such readers doubtless imagine Grewgious not genial: you would never persuade them he was one of the kindliest of men.

"J. B." and "H. L." both assume that Durdles and Deputy know all about the plot according to my interpretation. On the contrary, I doubt if Dickens meant that they should be found to have known anything directly related to it. But Durdles was a secretive person any way, and what he knew he could very well have kept to himself "for a consideration."

"J. B.'s" last remark that Datchery reddened because he stooped may be commended to all who know Dickens's way as an exquisite jest. Dickens would as soon have thought of mentioning that when Datchery stooped, the centre of gravity of his body was displaced, as to have referred—without a special object—to the circumstance that "a man of Datchery's age and build" (how much is told us on either point, by the way?) would "redden when he stooped." The stooping and reddening were brought in for a purpose, after Dickens's customary manner. But neither "H. L." nor "J. B." would notice this.

The real mystery, I fancy, in regard to "H. L." and "J. B." (and a few others) is, how they can have overlooked the real interpretation of the story, which once shown seems obvious. But Dickens knew all about this. As he said when the fall of the old house at the close of "Little Dorrit" proved so startling to many that they supposed it was suggested by an event which chanced to occur about that time. The story was full of indications from the very beginning that the old house was to fall, yet these indications had been overlooked by most as if they had had no existence. This carelessness Dickens came to regard as customary, and he trusted in it with confidence.

But "J. B." wants the explanation of the mystery of Edwin Drood to be "commonplace enough" for his comprehension, and it was scarcely a part of Dickens's plan to make the story quite so commonplace as that. It is just such readers who repeat the commonplace notion that Edwin Drood is an uninteresting story. Longfellow better understood his fellow-poet's work when he pronounced it the best thing Dickens had yet done. THOMAS FOSTER.

THE ZODIACAL LIGHT.

[1549]—The Zodiacal Light was seen here for the first time this winter on December 13, which is early. It is distinct, brighter than the Milky Way. HALLYARDS.

Pornic, Loire Inférieure, France.

OUR DUAL BRAIN.

[1550]—Your notes in these articles as to the idea that part of our lives have been lived before have interested me much, as I have often experienced it, and thought somewhat over the phenomena. In some cases I have been able to trace it to dreams (I dream very vividly, and every night), but only as to places, and then not satisfactorily. The phenomena with me are as follows:—Instead of paying attention to what is going on, my mind is occupied with something else, and I only hear and see, but without really paying any attention. On suddenly being compelled to do so, I am, as it were, in a trance or nightmare, feeling that all has passed before is known to me, *although I am unable to tell what is coming.* I seem to know, and when come it is as I expected. I have not tried to produce the effect, but think I could do so.

Often when reading, a similar phenomenon takes place. I read, my mind wanders; I know nothing of what I have read, but on reading it again I remember I have read it before.

It seems to me now, after reading your remarks, that one portion (the lesser, or weaker, or less intelligent) of my brain takes in what has passed, whilst the other, which is the higher and more important, is otherwise employed. On the sudden mental exertion to comprehend the matter fully, the lesser communicates to the higher suddenly, like a flash of lightning.

JOHN ALEX. OLLARD.

POLITICS IN AMERICA—AND ELSEWHERE.

[1551]—Anent your remarks as to the different lights in which Americans regard their President before and after election, might I venture to draw your attention to the following extract from Mr. Herbert Spencer's last work, "The Man versus the State"?—

Mr. Spencer draws attention to the change of feeling which "comes over constituencies when, from boroughs and counties, their members pass to the Legislative Chamber." He then proceeds:—"While before them as candidates, they are, by one or other party, jeered at, lampooned, 'heckled,' and in all ways treated with utter disrespect. But as soon as they assemble at Westminster, those against whom taunts and invectives, charges of incompetence and folly, had been showered from press and platform, excite unlimited faith. Judging from the prayers made to them, there is nothing which their wisdom and their power cannot compass."

Human nature is alike all the world over. No doubt the evil is far more apparent in the American Presidential election than in our own Parliamentary election; but I believe that if Englishmen had to elect a President, all the abuse which is now divided among hundreds of Parliamentary candidates would be centred upon the few Presidential candidates, and that we should be not one whit better than our "American cousins." A. F. OSBORNE.

Uxbridge, Dec. 19, 1884.

[Admitting fully the truth of what Mr. Herbert Spencer says, no impartial man would contend that anything like the gross personal invective and intrusion into the privacy of a candidate's life that characterises an American Presidential election has ever been found, or would ever for an instant be tolerated, in England.—ED.]

THE EYE THE ONLY COLOUR-BOX.

[1552]—An interesting letter on this seeming paradox, from the pen of Mr. Cave Thomas, appeared in the penultimate number of KNOWLEDGE. In it Mr. Thomas expresses his surprise that metaphysicians have hitherto made so little of this startling scientific fact. It may not be without interest to the readers of KNOWLEDGE to be informed that for many years past I have been elaborating a system of life and mind, or its strict correlation—the world and man—on the same principles. This synthesis I term the brain-theory of mind and matter, otherwise hylo-idealism, hylo-phenomenalism, autopsism, egoism, or autology. Its stand-point is the old pre-Socratic Protagorean one which the sophist of Abdera formulated in the terms, "Man is the standard of all things and nothings to man." I go a step further, and say "*The universe is myself,*" no mind being able to transcend itself, and all the universe of which it can have access to is that "imaginary" ideal or phenomenal one created by its own self-consciousness. This theory, if traced through all its ramifications, will be found to be of profoundly vital importance in the domain both of speculative and practical science and philosophy.

Before closing this letter, may I be allowed to ask for information, by the editor or other expert in the higher optics, as to the present most satisfactory explanation of erect vision, spite of the inversion of object-images on the retina? In a very able article of *Blackwood's Magazine*, so long since as June, 1842, of the Berkleyan theory of vision and idealism, the reviewer is puzzled by the same anomaly. He therein invites Sir David Brewster to solve this crux, a solution for which we are still waiting. I cannot think Kepler's *rationale*, in his "Supplement to Vitellio," at all satisfactory. Robert Lewins, M.D.

Army and Navy Club, Dec. 20, 1884.

[I rather fail to see in what Dr. Lewins's theory differs from that of Herren Fichte, Hegel, & Co. In connection with the paragraph with which the letter above concludes, see p. 198 of the current volume of Knowledge.—Ed.]

THE EFFECT OF TEA—THE DUALITY OF THE BRAIN.

[1553]—I had abstained from taking tea or coffee for nearly a year, but, by way of experiment, I took a cup of tea a few days ago at about half-past eight in the evening, the result being that I was unable to get to sleep until about five the next morning.

On the following day I tried the experiment again, taking the tea about six instead of half-past eight. The result was exactly same.

If tea is not injurious, sleepless nights are.

On the other hand, I am acquainted with a lady and gentleman who assert that they use tea as a remedy for sleeplessness.

If unable to sleep, they rise and make tea, and it never fails to produce the desired result.

If constitutions differ thus,
How can we all agree?
'Tis useless, then, to make a fuss
On coffee, wine, or tea.

An interesting point with regard to the duality of the brain is the fact that, when one leaves a place, one is often conscious of having forgotten something.

How common is the expression, "I'm sure I had something else to do."

And frequently the journey is over before the other half of the brain enables us to remember *what* that "something" is.

C. Carus-Wilson.

IS TEA INJURIOUS?—VEGETABLES *v.* MEAT.

[1554]—Having made many experiments on myself, I am able to say from experience that it is. After giving up tea for a time, I find that when I return to it that its taste is at first unpleasant, and were it not for the sugar and cream would be undrinkable. Soon after taking, it acts as an excitant, making me feel very clear mentally, and fit for studious work, and I can work well whilst the excitability lasts. Then follows a feeling of depression, which lasts for a variable time; during this period I am unfit for all work and in a low mood, which nothing but time and exercise will remove. If the tea be taken in the afternoon—say, after 5 p.m.—there is no sleep for me until 2 a.m. next morn. These effects, I must say, seem to wear away as the habit becomes usual. My first experiment, some six years ago, showed that tea is a strong paralysant of the nerve-centres governing the lower extremities. I had given up tea for a month; then at the house of an Anglo-Indian, I had some strong Indian tea at 6 p.m., and a cup of black coffee at 10 p.m. I went home at midnight, and found I was intoxicated and had not proper control over my lower limbs. I retired to bed, but did not sleep until 4 a.m.; I simply laid on my back, thought of nothing, but hummed one refrain over and over again. How I was next day I do not recollect. This and like trials showed me that tea is bad, and I only use it now when out visiting. Let other readers of Knowledge try the same experiment, and I promise them like results.

L. O'Shea Dillon, with many others, labour under a wrong idea when they think that vegetarians (so-called) are vegetable-arians. My food, as a non-flesh eater, contains very little greenstuff; peas, beans, lentils, rice, barley and oaten grits are my staple foods, to which I add a little carrot, turnip, and onion. These latter I use for bulk, flavour, and to supply a little vegetable acid. But these grains, with farinaceous puddings and fruit of every kind, fresh and dried, are my chief foods. Cabbage, greens, &c., I do not much use, nor even the potato above once or twice a week, as I can get my nourishment cheaper and less bulky from the cereals and pulses. T. R. Allinson, L.R.C.P.

[There can be no doubt that the flesh-eating races have been the conquerors of the world. It suffices to contrast the pusillanimous vegetarian Hindu with the brave and soldierlike meat-eating Sikh, to see to what phytophagism reduces a people. We could never have held India for a year, but for the condition to which its predominant races have been reduced by their vegetable diet.—Ed.]

LETTERS RECEIVED AND SHORT ANSWERS.

George Lacy. I suspect that the reply to your letter has been delayed through great pressure of business. You are, however, entirely in error as to any connection subsisting between the advertiser and the Editor or proprietors of Knowledge. I know nothing of the gentleman to whom you wrote, and have never had the slightest communication, oral or in writing, with him in my life.—G. G. Hardingham. Can you give me the approximate date at which you sent the book? because it has certainly never reached me. Mighty as Newton was as a mathematician and man of science, he was assuredly no authority on any theological question. You know, of course, that he suffered under mental aberration in the years 1692 and 1693; and it was during this period of temporary insanity that, at Dr. Bentley's request, he wrote his four letters on the existence of the Deity. So, too, his "Observations on the Prophecies of Daniel and the Apocalypse of St. John" hardly read like the composition of a man in full possession of his intellectual faculties. Your hint about the suggested alteration in our way of measuring time shall receive consideration.—Faciebat. Thanks; the two typographical errata to which you invite attention are corrected elsewhere. Augite occurs as a trap or intrusive material in metamorphic or any other rock. In the case referred to it must have belonged to the volcanic tufa. You are right in your interpretation of the letters. You can easily construct the diagram for yourself. Describe a circle of one inch in diameter. Call this the earth. Then, with the same centre, describe another circle round this of two inches in diameter to stand for the moon's orbit. Draw any diameter of the earth, and at the extremity of it draw a tangent to the one-inch circle (of course, at right angles to the diameter). This will obviously cut the outer circle at two points. Then will this tangent represent the horizon of the spectator, and the two places where it cuts the two-inch circle, the distance of the moon from the observer at the time of her rising and setting. While the place where the diameter produced cuts the semicircle shows how far she is from us when overhead. A glance at such a figure without any measurement will suffice. Sir Edmund Beckett's explanation rather supplements than contradicts mine. I heartily reciprocate your kind wishes.—R. L. Tidman. Fit only for the unfortunate creatures whose fatuous folly prompts them to believe in so gross an imposture as slate-writing, or (Heaven save the mark!) "psychography." As for that most respectable and ingenuous person, Madame Blavatzky, see the *Madras Christian College Magazine* for November.—A. Le Suer. Thanks for your very useful hint.—Ktima. The meridian of 180° may correspond to either one of two days, for a perfectly obvious reason. See reply to "Istoria," in p. 513 of the volume just concluded.—M.D. Note that I spoke of *sensations*, not of either emotion or volition. But the two last states of consciousness may obviously co-exist, because I may will to knock a man down with whom I am (absolutely simultaneously) angry for a gross insult. Under ordinary circumstances, though, what I may not very scientifically describe as different sorts of consciousness, must be separated from each other by some interval, be it ever so minute. I heartily reciprocate your good wishes.—G. A. M. Too great a heap of matter just now to leave room for reports of lectures.—C. N. You will see from letter 1552, page 17, that Dr. Lewins has already had his own say upon what he claims as his theory, but which is really only a re-statement in other words of ideas developed by Berkeley in this country, and later on by some of the German metaphysicians.—Under Grad. (L.U.). Your intimation that you "shall have no hesitation in risking, say, a matter of £5 as to the *bonâ-fides* of your contention" is a stupendous puzzle to me. Do you think that the Messrs. Wymans or I am prepared to risk a prosecution under 16 and 17 Vict., c. 119, s. 3, by turning 74, Great Queen-street into a betting-house? Heat is nothing but another *form* of motion. If you check the rotation of a fly-wheel by a brake or clutch you set up molecular vibration or motion in that brake which constitutes, and becomes apparent as, heat, and, *pro tanto*, diminishes the motion of the fly-wheel. I am not concerned to defend all that has been written about the retardation of the rate of the earth's axial rotation, for the simple reason that, in the existing condition of our knowledge, no *proof* whatever exists of such retardation. Its assumption serves to explain certain other phenomena; but that is a very different thing indeed.

Our Inventors' Column.

So great is the number of inventions now patented that many good things are comparatively lost in the crowd. A succinct account, therefore, by an Expert, of all inventions of really popular interest and utility must be advantageous both to the public and the Inventor, enabling persons to hear of inventions already desiderated by them, and thus acting reciprocally as a stimulant on supply and demand.

PERRY'S AUTOMATIC SPRING LETTER-CASE.

A REALLY good letter-case is a most important convenience to every business man. Messrs. Perry & Co., of 18, Holborn Viaduct, E.C., have recently brought out what is known as their automatic Spring Letter-case, wherein the papers are secured by the agency of steel springs fixed in the back of the case, the springs being of unusual strength and durability, and capable of withstanding the wear and tear of years of constant hard usage. This invention, too, seems well suited for holding the various printed forms used in an office, such as price-lists, circulars, consignment notes, &c.; two inches thick of these can be inserted instantly, and taken out as required with the utmost facility.

THE "EXPANSILE" MUSIC-FOLIO LOCK AND CLIP.

MANY among us have occasion to carry music-folios and documents generally, and in such cases a good substitute for, say, the india-rubber bands is much wanted. This requisite appears to be furnished by what are known as the "expansile" lock and "præsidium" clips, designed by Mr. F. E. Taylor, of 115, Newhall-street, Birmingham, to entirely supersede the old-fashioned appliances at present in use, and the music cover fitted with this lock and clips will be appreciated by all who examine it. The interior of the case is fitted with two of these clips, which hold the music very conveniently, and cannot be broken unless made of bad metal. The "expansile" lock, as indicated by its name, expands according to the thickness of the documents which it has to secure. It is used to lock up the case. The "expansile" is manufactured in brass or nickel, and forms an ornamental addition to any article whereon it is placed. If used on a carrier with flap, or in conjunction with the new patent lock ("the expansile") on a carrier without flap, no elastic whatever is required, either inside or out, a circumstance unparalleled in the manufacture of these articles. The "præsidium" clips can also be made to expand.

NEW ENSILAGE CUTTER.

THE great advance now made in the Silo system is getting to be noticeable all over the country, and agriculturists in general appear fully aware of the advantages to be derived from the production of ensilage, which formed so conspicuous a feature of the late Cattle Show. In connection with this subject mention may be made here of Messrs. Richmond & Chandler's New Ensilage Cutter, which may be described as being a powerful cutting machine, fitted with an open rising cover to prevent choking. It has three strong knives on the fly-wheel, and the rise and fall of top roller is regulated by two spiral springs in place of weight and lever. It has especial safeguards to prevent accident to the attendant by an instantaneous stop-motion that can be worked by either hand or foot; also a reverse motion that would be immediately put into action in the event of the man's safety being endangered. The hopper is fitted with an endless web that delivers the material in regular quantity to the feed rollers. The fly-wheel is protected by a wooden cover that prevents the cut stuff flying about and clogging the gearing. The apparatus for delivering the cut ensilage into the silo consists of a revolving web working at the bottom of a trough underneath the machine, and upon which the cut material falls; this rapidly delivers it to an elevator worked by chain gearing, which in its turn conveys it into the Silo. The whole machine is very portable, being fitted with wheels and shafts for facility of transit.

THE IMPERIAL BROUGHAM HANSOM.

CARRIAGE construction has of late years greatly exercised the ingenuity of inventors. One of the examples of this fact is found in Messrs J. Marston & Co.'s Patent Imperial Brougham Hansom, which may be shortly described as a very convenient business carriage, capable of being used open or closed, and as an evidence of its merits may be cited the fact that it has won a first prize in all competitions. The doors are so constructed as to open inwards or outwards; they can also be used half open when for a single journey or emergency; with a movable seat it will carry the third or fourth passenger; the windows on the sides and back fall down; the doors open inwards, quite out of the way, leaving the whole of the front, side, and back entirely open or closed at will, and without the least trouble or change. In appearance and style it is a perfect single brougham, without a boot, but with an entire unobstructed view all round. It is lighter than the ordinary hansom, possesses all the comforts of a brougham and an open or closed carriage combined. It can be adapted to all seasons; without leaving the seat, it may be opened or closed as much as the weather requires, and can be driven from the inside. The lamps light the inside as well as the out. Illustrated descriptions of this carriage may be obtained from Messrs. J. Marston & Co., 21, Bradford-street, Birmingham.

CAPTAIN GOLDFRAP'S PATENT NOSE-BAG.

THE present is decidedly a humane age, especially as regards the lower animals. Most persons must at times have remarked on the great waste of grain and fodder due to the defective make of nose-bags, whence too many horses suffer semi-starvation at times. The object of Captain Goldfrap's patent is to remedy this defect, and this object is fully attained by a simple arrangement which allows the animal to lower and raise his head easily in the bag without obstruction. There is no necessity for him to chuck up the bag, and finding this he discontinues doing so. The use of the new nose-bag will prevent many accidents which now happen through the removal of the bridle. It cannot slide off the neck, and the horse can eat the whole of his food without any alteration of the strap. The fittings will, it is claimed, last out many bags, and the bags themselves, which never touch the ground, will last considerably longer for that reason. All lovers of horses should do their best to bring these excellent bags into universal use. The depôt for these bags is 17a, Great George-street, Westminster.

OUT-DOOR COOKING.

IN these days of much sudden locomotion, of rapid transfer from the comfort of "the shady side of Pall Mall" to the ruggedness of the Soudan, or the arid waste, maybe, of an Asiatic steppe, appliances for effective open-air cookery are simply invaluable to many. In view of this fact, Messrs. Adams & Son, of 57, Haymarket, are now manufacturing a patented invention of Captain J. C. Baxter, of the Royal Engineers, designed for outdoor or jungle cooking. The apparatus consists of two or more annular kettles—*i.e.*, kettles having a tube through their centre. When these kettles are placed one upon the other, the combination of the tubes forms a flue or chimney in which any description of fuel, such as grass, cow or camel's dung, or even damp wood, is by the induced draught caused to burn freely, and with such results as to heating power, that 27½ gallons of water are brought to the boil in ten minutes; while in twenty-five minutes rations for 70 soldiers can be made ready with the expenditure of only 8 lb. of common firewood. These kettles are made in sets of sizes and numbers to suit all classes of travellers, and pack one within the other when out of use in so portable a fashion that one capable of cooking for a detachment of 70 soldiers can be carried by a single man.

THE "FRANCHISE" GRATE.

THE ingenuity of inventors seems really inexhaustible in connection with grates. The latest example of this appears to be a new patented invention known as Jaffray's "Franchise" Grate, which is said to effect an extraordinary economy in fuel. The interior is composed of fire-bricks, carefully fitted together, with a back-plate of cast iron. All these are loosely placed, and can be removed by hand, so that the flue can be readily cleaned with an ordinary hand-brush. The quantity of fire-brick in the construction is so large as to present a heating surface of about 1,600 superficial inches in a grate of ordinary size. As the fire-brick, when made red hot, is itself a medium for the diffusion of heat, only half the quantity of coal to that used in an ordinary grate is required, and the fire-basket, therefore, is made very small. This constitutes one only of the advantages of the grate on the score of economy; the essence of the invention lies in its also burning the gases that under ordinary circumstances are driven up the chimney, carrying with them a very large proportion of the generated heat. In the Jaffray grate a direct up-draught is avoided. The register immediately above the fireplace is closed after the fire is lit, and the effect is to create a down, or rather a backward, draught, which carries the smoke and gas through longitudinal perforations in the sloping fire-brick back of the grate, and passes them again through the fire to a hot chamber, where, with heated atmospheric air, they are burnt, the residue of the smoke escaping into the chimney through a very narrow neck, so placed that the risk of smoky chimneys is reduced to a minimum. This invention is undoubtedly a valuable practical contribution to our domestic economy. It may be seen at work at the Jaffray Patent Grate Company's offices, 6, Charing Cross, London.

XUM

Our Chess Column.

By MEPHISTO.

ONE of a number of games played simultaneously at Ilkley :—

White. Amateur.	Black. J. Gunsberg.
1. P to K4	P to K4
2. Kt to KB3	Kt to QB3
3. B to K2	

A move which often brings about an open game. If Black replies with 3. B to B4, then White plays 4. Kt × P, &c. We cannot recommend 3. B to K2.

	P to KB4
4. P × P	

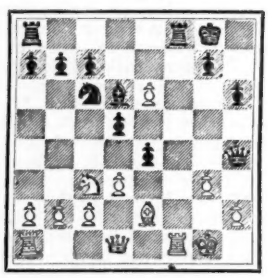
P to Q4 was preferable.

	P to Q4
5. Castles	B × P
6. P to Q3	Kt to KB3
7. B to Kt5	B to Q3
8. Kt to B3	B to K3
9. Kt to KR4	Castles
10. P to B4	P to KR3
11. B × Kt	Q × B
12. P to B5	

12. P × P was safe, for if Q × P 13. P to Kt3. White, however, wished to avoid exposing his position.

	Q × Kt
13. P × B	P to K5
14. P to KKt3	

BLACK.



WHITE.

	B × P
15. P × B	Q × P (ch)
16. K to R sq.	Q to R6 (ch)
17. K to Kt sq.	P to K6
18. R to B3	R × R
19. B × R	Q to Kt6 (ch)
20. B to Kt2	R to KB sq.

White has defended himself well. Black now threatens either R to B7 or Q to B7 (ch), followed by R to B5.

21. Q to R5

If now R to B7, then 22. Q to R3.

	Kt to K4

One of those desperate attempts at catching which now and then come off.

22. P to K7

Caught!

	R to B7!
23. P to K8 (Q) (ch)	K to R2
24. Q to R3	Kt to B6 (ch)
25. K to R sq.	Q × Q (ch)
26. B × Q	R to R7 mate

There was only one way of avoiding the mate in this interesting position. White on his 24th must give up one of his Queens, as he could not otherwise defend the B, for if Q to R2, Kt to B6 (ch); but if

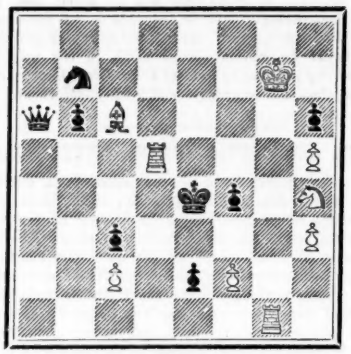
24. Q (K8) to Kt6 (ch)	Kt × Q
25. Q to R3	Q to Kt4
26. Kt × P	Kt to R5
27. Kt × P	R to B6

and again Black ought to win.

SELECTED PROBLEM No. 144.

By W. GRIMSHAW.

BLACK.



WHITE.

White to play and mate in three moves.

SOLUTION.

PROBLEM No. 141, BY C. PLANCK, p. 514.

1. P to R4	Kt × B or KtP
2. Kt (R6) to Kt4 (ch)	K to B4
3. R to B7 mate	
(*a*)	Kt × RP
2. B to Q3	K × Kt
3. B to K4 mate	
if	2. Kt to Kt3 or B4
3. Kt or QKt to Kt4 mate	
(*b*)	Kt to Q2
2. R × Kt!	K × R
3. Kt to Kt6 mate	

ANSWERS TO CORRESPONDENTS.

*** *Please address Chess Editor.*

Correct solutions received from W. Donna, Uncle John, O. H. Labone, G. W., R. Wilson, C. H. F., Nemo, G. Mitchell, Punctual.

R. S.—Pray excuse, as on account of holidays and absence from town, our correspondence has been somewhat thrown out of gear.

W. Grimshaw.—Received with thanks.

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